Agricultural trade liberalization and economic development: the role of downstream market power

Richard J. Sexton\textsuperscript{a}, Ian Sheldon\textsuperscript{b,*}, Steve McCorriston\textsuperscript{c}, Humei Wang\textsuperscript{d}

\textsuperscript{a}Department of Agricultural and Resource Economics and Giannini Foundation of Agricultural Economics, University of California, Davis, CA 95616, USA
\textsuperscript{b}Department of Agricultural, Environmental, and Development Economics, Ohio State University, Columbus, OH 43210, USA
\textsuperscript{c}School of Business and Economics, University of Exeter, Exeter EX4 4PU, UK
\textsuperscript{d}California Department of Health Services, Sacramento, CA 95899, USA

Received 5 July 2005; received in revised form 14 April 2006; accepted 10 August 2006

Abstract

A model is developed to characterize the vertically linked and concentrated nature of developed-country food markets. This model is then parameterized and used to simulate the effects of varying food market structures on the benefits to developing-country exporters of agricultural commodities from trade liberalization by developed countries. Results demonstrate that even relatively modest departures from perfect competition can cause much of the benefits from trade liberalization to flow to marketing firms instead of producers in the developing country. The distributional effects under downstream market power differ significantly from the perfectly competitive case and may result, somewhat paradoxically, in developing countries receiving a lower share of the total value added within the food chain as trade reform occurs.

JEL Classification: F12, F13, O12

Keywords: Developing countries; Oligopoly; Oligopsony; Trade liberalization; Vertical market structure

1. Introduction

The Doha Round of trade negotiations in the World Trade Organization (WTO) has been labeled the “development round,” a key part of which will be increasing developing countries’ access to developed-country markets (Anderson and Martin, 2005). This process will involve the reduction of tariffs on agricultural commodities, 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, in terms of the potential benefits to developing countries, there are two interrelated issues. First, recognizing the vertically linked nature of the food chain among agriculture, food processing and retailing, 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. Second, in terms of the total value of the product that reaches consumers, the raw agricultural component typically represents a small share. This has caused many in developing countries as well as in international institutions to advocate diversification in developing countries, involving the processing of and adding value to the raw agricultural commodity (UNCTAD, 2002a).

These issues can be related explicitly to the broader popular debate about globalization. First, concerns have been expressed that increasing concentration of the global food system harms producers of export commodities critical to many developing countries. 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.\footnote{Over the period 1998–2001, real coffee prices fell by 50%. As a result, for a country such as Ethiopia, where coffee represented 67% of the value of exports in 1998, the decline in world coffee prices cost Ethiopia US$ 300 million in export revenues, equivalent to 50% of its annual export earnings (Oxfam, 2001).} At the same time, in key export markets such as Europe and the United States, global coffee buyers, roasters, and retailers, who in total account for almost 60% of the share of final sales value of coffee, have benefited from lower coffee bean prices (Oxfam, 2001).\footnote{All three sectors are dominated by a small number of firms. For example, in 1995, 10 firms accounted for 62% of global coffee bean trade, while in 1998, five firms accounted for 58% of sales of roasted coffee in the European market (Fitter and Kaplinsky, 2001).} Second, tariff

\* Corresponding author. Tel.: (614)-292-2194.
E-mail address: sheldon.1@osu.edu (Ian Sheldon).
reduction and market access go right to the heart of the debate over whether smallholder farmers in developing countries will truly benefit from globalization. On the one hand, development agencies such as the World Bank (2003), and NGOs such as Oxfam, have argued extensively that removal of trade distorting agricultural policies in both the developed and developing countries has the “potential to act as a powerful catalyst for poverty reduction” (Oxfam, 2003, p. 7) in the developing countries. On the other hand, critics of globalization have argued that it may generate negative effects for developing-country farmers.

The Mozambique cashew nut sector provides a good example of this debate. In the early 1990s, Mozambique removed taxes on the export of raw cashews in response to advice from the World Bank. The World Bank (1995) forecast that cashew nut farmers’ incomes would increase between US$ 17.4 and 27.9 million in the first 2 years of the reform. However, McMillan et al. (2002) report that the actual gains to cashew nut farmers were only US$ 5.3 million. At the same time, urban unemployment increased as labor released from cashew nut processing failed to move into other activities. This case became a “cause célèbre” for the antiglobalization movement, and a focus for attacking World Bank policies (McMillan et al., 2002, p. 1).

What the World Bank ignores in its estimates was that the impact of reform in the Mozambique cashew nut sector was in large part influenced by the characteristics of the downstream sector which cashew nut farmers supplied. As McMillan et al. (2002) note, traders downstream from farmers are competitive in selling cashews, but have buying (monopsony) power in the purchase of cashews. As a result, even though export prices for raw cashew nuts did increase, as predicted by theory, export traders captured a relatively large share of the benefits from removal of the export tax, reducing the income gains to farmers.  

Therefore, in analyzing the impact of trade liberalization on developing countries, it is necessary to understand the vertical linkages that characterize food markets in many developed countries. We argue in this article that the modern food marketing system in many industries is most appropriately characterized by a successive oligopoly/oligopsony structure, with developing-country exporters of raw commodities entering at the first stage, and show that the implication of reducing tariffs or export taxes under this structure may be much different in magnitude from that implied by models that assume perfect competition. Moreover, the distributional effects will also differ relative to the perfectly competitive case and may result, somewhat paradoxically, in developing countries receiving a lower share of the total value added within the food chain as trade reform occurs.

We develop this theme by first presenting some evidence on the structure of the food chain in developed economies, focusing specifically upon the European Union (EU) and the United States. We then develop, in Section 3, a model that characterizes the vertically linked nature of developed-country food markets. The model is based on a market setting in which a primary agricultural product such as coffee is exported from a developing economy, and is then processed and sold in a developed economy. The market structure in the developed economy features independent processing and retailing sectors, both of which may exhibit market power. Next, in Section 4, we derive the implications of various combinations of market structures in the processing and/or the retailing sector on total market surplus, and the distribution of benefits from reducing a per-unit tariff among consumers in the developed economy, developing-country producers, and marketers (processors and retailers), given price-taking behavior by farm producers and consumers but possible oligopoly and/or oligopsony power exercised by the marketing sector. Some extensions are outlined in Section 5, and in Section 6 we summarize and conclude.

2. Market structure of the food sector in developed economies

As noted, the food industry is typically highly concentrated in developed countries at both the retail and processing stages and, further, concentration is rising over time. 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.

2.1. Food processing

In the United States, the top-20 food-manufacturing firms accounted for 37% of value added in 1997, while the top-20 beverage- and tobacco-manufacturing firms accounted for 79% of value added (U.S. Census Bureau, 2001). Using more disaggregated data at the four-digit SITC level, the average four-firm concentration ratio (CR4) in U.S. food manufacturing was about 76% in 1997, ranging from 62% in sugar cane mills to 98% in cigarettes.

Average seller concentration in the EU is higher than in the United States, ranging from an average CR3 of 55% in Germany to 89% in Ireland, with an average CR3 across nine EU countries of 67% (Cotterill, 1999). 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. 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).

---

3 Another example is Ivory Coast cocoa market liberalization (Wilcox and Abbott, 2004). Prior to liberalization, para-statal marketing boards controlled all levels of marketing of cocoa beans and also taxed cocoa bean exports. Liberalization has resulted in backward integration by multinational cocoa processor-exporters who now capture a portion of the rents previously collected as export taxes.

4 As the focus of this article is on gains to developing country exporters from trade liberalization, we abstract from any impacts on developed country agricultural sectors.
2.2. Food retailing

Several important differences are apparent in the food retailing market structures in the United States and EU. Average CR5 in food retailing at the national level in the EU is 65%, much higher than in the United States, where the comparable figure is 35% (Cotterill, 1999; McCorriston, 2002). However, at the EU-wide level, CR5 is much lower at 26% (Hughes, 2002). Because retail markets are localized in geographic scope, it is important in considering retailer oligopoly power to examine concentration at the local and regional level. In this regard, Cotterill reports that in 1998, CR4 in the United States averaged 74% across the top-100 U.S. cities.

2.3. 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 increased concentration. Domestic mergers and acquisitions in the food sector doubled between 1990 and 2002 (McCorriston et al., 2004). Moreover, international mergers and acquisitions have also been increasing significantly. For example, EU-based retailers such as Royal Ahold and Sainsbury have expanded into U.S. markets, and Wal-Mart has expanded into the EU. As a result, food retailing is becoming increasingly multinational with three food retailers Wal-Mart, Carrefour, and Royal Ahold now appearing in the world’s top-100 multinational corporations (UNCTAD, 2002b).

Although the high and rising concentration in the food sector is not a debatable point, empirical evidence on the extent of the actual exercise of manufacturer and retailer market power in developed-country food sectors is rather mixed. Surveys of the recent empirical work by Sexton (2000), Sexton and Lavoie (2001), and Sheldon and Sperling (2003) reveal evidence of only modest departures from perfect competition for a wide range of products in the food manufacturing/processing sector. Table 1 summarizes results of market power estimates for a broad range of industries. The theoretical range for the market power parameters in the table is from 0 (perfect competition) to 1 (monopoly or monopsony). Although a few estimates are in the vicinity of 0.5 (market power equivalent to that of a homogeneous Cournot duopoly or duopsony) or higher, most are much lower—0.25 (the market power equivalent of a homogeneous four-firm Cournot oligopoly or oligopsony) or less.

3. Agricultural trade and importing country market power

Despite the observation that the food sector would appear to be imperfectly competitive at multiple stages, departures from the competitive-markets paradigm have seldom been considered by economists conducting trade-policy analysis. Most empirical studies assume perfect competition at a single stage, e.g., the FAPRI (Devadoss et al., 1993) and AGLINK (OECD, 2005) policy forecasting models. Even the recent and widely cited work on the impact of protectionism in the EU by Messerlin (2001) reports results that treat the agricultural sector as perfectly competitive, with the exception of the bananas subsector.5

Indeed, only in recent years have papers begun to consider the role of vertical market structure in thinking about optimal trade policy. Spencer and Jones (1992), Ishikawa and Spencer

---

Table 1

<table>
<thead>
<tr>
<th>Study</th>
<th>Industry</th>
<th>Market Power</th>
<th>Lerner Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appelbaum (1982)</td>
<td>U.S. textiles</td>
<td>0.05*</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>U.S. tobacco</td>
<td>0.40*</td>
<td>0.65</td>
</tr>
<tr>
<td>Lopez (1984)</td>
<td>Canadian food processing</td>
<td>0.19*</td>
<td>0.50</td>
</tr>
<tr>
<td>Schroeter (1988)</td>
<td>U.S. beef-packing</td>
<td>0.22*</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(1) oligopoly</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) oligopsony</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Karp and Perloff (1989)</td>
<td>Rice export</td>
<td>0.68*†</td>
<td>0.11</td>
</tr>
<tr>
<td>Azzam and Pagoulatos</td>
<td>U.S. meat (oligopoly)</td>
<td>0.22*</td>
<td>0.46</td>
</tr>
<tr>
<td>(1990)</td>
<td>U.S. livestock (oligopsony)</td>
<td>0.18*</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>U.S. composite meat processing</td>
<td></td>
<td>0.74</td>
</tr>
<tr>
<td>Schroeter and Azzam</td>
<td>U.S. beef</td>
<td>0.05*</td>
<td>0.55</td>
</tr>
<tr>
<td>(1990)</td>
<td>U.S. pork</td>
<td>0.06*</td>
<td>0.47</td>
</tr>
<tr>
<td>Buschera and Perloff</td>
<td>Philippines coconut oil</td>
<td>0.58*</td>
<td>0.89</td>
</tr>
<tr>
<td>Wann and Sexton (1992)</td>
<td>U.S. grade pack pears</td>
<td>0.08*</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>U.S. fruit cocktail</td>
<td>0.48*</td>
<td>1.41</td>
</tr>
<tr>
<td>Deodhar and Sheldon</td>
<td>German bananas</td>
<td>0.29†</td>
<td>0.26</td>
</tr>
<tr>
<td>(1995)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deodhar and Sheldon</td>
<td>German bananas</td>
<td>0.20††</td>
<td>0.18</td>
</tr>
<tr>
<td>(1996)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bhuyan and Lopez</td>
<td>U.S. food industries</td>
<td>0.18*†</td>
<td>0.33</td>
</tr>
<tr>
<td>(1997)</td>
<td>U.S. tobacco industries</td>
<td>0.18*</td>
<td>0.33</td>
</tr>
<tr>
<td>Wilson (1997)</td>
<td>U.K. bread manufacturing</td>
<td>0.31</td>
<td>0.84</td>
</tr>
<tr>
<td>Genovese and Mullin</td>
<td>U.S. sugar industry</td>
<td>0.04††</td>
<td>0.05</td>
</tr>
<tr>
<td>(1998)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steen and Salvaness</td>
<td>French fresh salmon</td>
<td>0.02–0.05††</td>
<td>0.12–0.04</td>
</tr>
<tr>
<td>(1999)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bettenhof and Verboven</td>
<td>Dutch coffee roasting</td>
<td>0.02–0.17**</td>
<td>0.07–0.54</td>
</tr>
<tr>
<td>(2000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gohin and Guyomard</td>
<td>French food retailing:</td>
<td>−0.02*</td>
<td>0.20</td>
</tr>
<tr>
<td>(2000)</td>
<td>(1) dairy products</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) meat products</td>
<td>−0.03*</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>(3) other food products</td>
<td>0.01*</td>
<td>0.12</td>
</tr>
<tr>
<td>Wilcox and Abbott</td>
<td>Ivory Coast cocoa exports:</td>
<td>0.47–0.77**</td>
<td>0.25–0.37</td>
</tr>
<tr>
<td>(2004)</td>
<td>(1) government/exporters</td>
<td>0.47–0.77**</td>
<td>0.25–0.37</td>
</tr>
<tr>
<td></td>
<td>(2) exporters</td>
<td>0.19–0.48**</td>
<td>0.09–0.20</td>
</tr>
</tbody>
</table>

This is a revised version of a table from Sheldon and Sperling (2003)

*Estimates based on joint oligopoly/oligopoly power; †Bhuyan and Lopez (1997) also calculated Lerner indices for 40 4-digit SIC food industries, ranging from 0.72 for cereal preparation to 0.08 for dried fruit and vegetables; ‡Estimate based on a closed loop dynamic model; †Static and dynamic estimate; ‡Conjectural elasticity and †conjectural variation –both parameters range from 0 for perfect competition to 1 for monopoly; ††The Lerner index is defined as the conjectural elasticity divided by the elasticity of supply (demand)

---

5 Messerlin (2001) does acknowledge that a few large traders in grains and sugar could result in imperfect competition in these subsectors, and that there may be imperfect competition at the food retailing level.
(1999), and Sheldon et al. (2001) are examples of theoretical models that extend the Brander and Spencer (1985) result on export subsidies to vertical markets, while McCorriston and Sheldon (1996) examine the incidence of reform of the EU banana regime in a vertical market setting of successive oligopoly.

Given this background, it is useful to consider a flexible model setting that enables the impacts of a wide range of competitive outcomes to be studied. Specifically, we consider a market setting in which a primary agricultural product such as coffee, tea, or cocoa is exported from a developing economy, and it is processed and sold in a developed economy. The market structure in the developed economy features independent processing and retailing sectors, both of which may exhibit market power.

Consumers’ inverse excess demand in the developed economy for the retail product is

\[ P^r = D(Q^r | X), \] (1)

where \( Q^r \) is the market quantity of the retail product, \( P^r \) is the market price, and \( X \) denotes unspecified demand shifters. Farmers in the developing country are assumed to be price takers in their output market. Inverse excess farm supply of the raw commodity is expressed as

\[ P^f = S(Q^f | Y), \] (2)

where \( P^f \) is the price received at the farm, \( Q^f \) is the total volume of farm shipments, and \( Y \) represents unspecified supply shifters. The raw product is subject to a per-unit import tariff of \( T \).

To focus the model on the implications of possible market power in the marketing sector of the developed economy, we make a number of simplifying assumptions about the technologies for the processing and retailing sectors. Both food processors and retailers are assumed to utilize a constant-returns technology. Further, we assume that these technologies are quasifixed proportions in the sense that no substitution is permitted between the raw farm input and other inputs in producing the finished product. However, substitution among other processing and retailing inputs (e.g., labor and energy) is permitted. In addition, we assume that retailers’ costs for the product under investigation are separable from the costs of other products sold at retail. For convenience and without further loss of generality, we choose to measure units at the various stages in the market so that \( Q^f = Q^w = Q \), where the superscripts \( f \), \( w \), and \( r \) denote the farm, wholesale or processing, and retail sectors, respectively. Given these assumptions, changes in market concentration have no cost-side effects, enabling the analysis to focus solely on the competition impacts.

Denote a representative processing firm’s volume of raw product purchases by \( q^w \). A representative retailer’s variable cost function for selling the product is

\[ C^r = c^r(V^r) q^r + (P^t + T) q^t, \] (3)

where \( c^r(V^r) \) represents the constant processing costs per unit of raw product processed, \( V^r \) is the vector of prices for variable processing inputs, and \( P^t \) is the raw product price received by producers in the developing economy.

Denote a representative retailer’s volume of wholesale purchases by \( q^w \). A representative retailer’s variable cost function for selling the product is

\[ C^r = c^r(V^r) q^w + P^w q^w, \] (4)

where \( P^w \) is the wholesale price, \( c^r(V^r) \) represents the constant retailing costs per unit of wholesale product sold, and \( V^r \) is the vector of prices for variable retailing inputs.

We now derive the implications of various combinations of oligopoly and oligopsony power in the processing and/or the retailing sector for total market surplus, and the distribution of surplus among consumers, producers, and marketers (i.e., processors and retailers), given price-taking behavior by farm producers in the developing country and by consumers in the importing country. To simplify notation, we drop further reference to the exogenous variables \( X, Y, V^w, \) and \( V^r \).

3.1. Manufacturers or retailers may have both oligopsony and oligopoly power

In this case we assume that either retailers or manufacturers are price takers, i.e., given market power in one of the marketing sectors, the other sector is competitive. Given the model...
structure, the output, farm price, consumer price, and aggregate welfare effects are identical for a given degree of market power regardless of whether the power is held by food processors or by food retailers. To simplify the exposition, we develop the case in which food manufacturers may exercise market power and retailers are competitive. In this case, the retail price is \( P^r = P^w + c^v \).

A representative processing firm’s profit function can be expressed as

\[
\pi^w = (D(Q^w) - c^v)q - S(Q^f)q - (c^w + T)q, \tag{5}
\]

where \( q = q^w = q^f \) is the firm’s level of output and volume of farm product purchases. The first-order necessary condition for maximizing Eq. (5) is

\[
\frac{\partial \pi^w}{\partial q} = P^w + \frac{\partial D(Q^w)}{\partial q} Q^w - (P^f + c^w + T)
- \frac{\partial S(Q^f)}{\partial q} Q^f q = 0. \tag{6}
\]

Eq. (6) can be written in elasticity form as

\[
P^w \left(1 - \frac{\xi^w}{\eta^w}ight) = P^f \left(1 + \frac{\theta^f}{\xi^w}ight) + (c^w + T), \tag{6'}
\]

where \( \xi^f = \frac{\partial \mathcal{Q}^w}{\partial P^w} \frac{P^w}{Q^w} \) is the market price elasticity of supply of the farm product, \( \eta^w = \frac{\partial \mathcal{Q}^w}{\partial P^w} \frac{P^w}{Q^w} \) is the absolute value of the market price elasticity of derived demand for the processed product when the retailer behaves competitively, and \( \theta^f = \frac{\partial \mathcal{Q}^w}{\partial q} \). \( \xi^w = \frac{\partial \mathcal{Q}^w}{\partial q} \) are market-power parameters. Here \( \theta^f \in [0, 1] \) measures the processing firm’s oligopsony market power in procuring the farm product and \( \xi^w \in [0, 1] \) measures the firm’s oligopoly power in selling the product to retailers. The parameter, \( \theta^f(\xi^w) \) is either interpreted as a “conjectural elasticity” or, more simply, as a measure of the mark down (mark up) of the input price (output price), relative to the marginal value product (marginal cost). \( \theta^f = 0 (\xi^w = 0) \) corresponds to perfect competition, and \( \theta^f = 1 (\xi^w = 1) \) represents pure monopsony (monopoly). Intermediate values of \( \theta^f(\xi^w) \) in the open interval \((0, 1)\) represent degrees of oligopsony (oligopoly) power, with larger values of \( \theta^f \) and \( \xi^w \) indicating greater departures from competition. By focusing directly on the end product of oligopsony/oligopoly power, as measured by the parameters \( \theta^f \) and \( \xi^w \), we need not be concerned with particular market structures or oligopsony/oligopoly games. This makes the model a very convenient tool for conducting simulations of alternative competitive scenarios.

Aggregation from the firm to the industry is accomplished readily within this model framework. Because firms produce a homogeneous product and have identical technologies, optimizing behavior compels that \textit{ex post} all firms’ conjectures are identical (Wann and Sexton, 1992). Eq. (6') thus represents an equilibrium condition that in conjunction with the retail demand and farm supply functions specified in (1) and (2), respectively, and the retailer cost function, (4), yields equilibrium values for \( P^r, P^w, P^f, \) and \( Q \).

### 3.2. Market power at successive market stages

Now we consider scenarios in which retailers in the importing country may exercise oligopoly power over consumers and domestic processors may exercise oligopsony power over farmers in procuring the raw product, and, in addition, processor–retailer interactions may be characterized by imperfect competition. We consider two alternative cases for the processor–retailer interactions. The first involves processor oligopoly power and retailer price taking in the processor–retailer interactions (successive oligopoly), and the second involves retailer oligopsony power and processor price taking (successive oligopsony) in the processor–retailer interactions. The case in which both retailers and processors attempt to exercise market power in their mutual interactions must be studied within a bargaining environment, which is beyond the scope of the present study.\(^{12}\)

It should be noted that the exercise of market power at successive vertical stages in a market chain represents a market failure that may, in principle, be corrected through vertical coordination across market stages. In particular, the solutions we adduce evince the well-known “double-marginalization” problem noted first by Spengler (1950). If firms are able to coordinate vertically, they can eliminate the double-marginalization problem and increase the total amount of profits to be shared between them. Katz (1989) remains a good summary reference on the instruments of vertical control. Our results in this subsection should, thus, be interpreted to apply in settings in which instruments of vertical control are either unavailable, prohibitively costly to implement, or illegal under prevailing antitrust statutes, e.g., Viscusi et al. (2000). If manufacturers and retailers with market power are able to solve their double-marginalization problem, the results of the previous subsection apply.

For the case of successive oligopoly power, a representative retailer’s profit function can be expressed as

\[
\pi^r = D(Q)q - P^w q - c^v q, \tag{7}
\]

\(^{12}\)One plausible outcome of processor–retailer bargaining is that they would agree on the volume of trade that maximized their mutual benefit, with bargaining restricted to determining the division of surplus between the bargainers. This outcome is identical in terms of output, retail price, farm price, and welfare distribution to the equilibria described in the previous subsection when only processors or retailers exercised market power.
The first-order condition for maximizing Eq. (7) with respect to $q$ is

$$P^f \left(1 - \frac{\xi^f}{\eta^f} \right) = P^w + c^f. \quad (8)$$

Using the retail demand function, $D(Q)$, to substitute for $P^r$ in (8), we can solve equation (8) for the retailer’s inverse derived demand function for the processed product: $P^w = D^w(Q | \xi^f, c^f)$.

A representative processing firm’s profit function can then be expressed as

$$\pi^w = D^w(Q | \xi^f, c^f)q - S(Q)q - (c^w + T)q. \quad (9)$$

The first-order condition for maximizing Eq. (9) with respect to $q$ is

$$P^w \left(1 - \frac{\xi^w}{\eta^w} \right) = P^f \left(1 + \frac{\theta^f}{\theta^w} \right) + (c^w + T), \quad (10)$$

where $\xi^w$ denotes the degree of the processors’ oligopoly power, and $\eta^w$ is the elasticity of derived demand, given retailer oligopoly power (in general, $\eta^w \neq \eta^r$). Eqs. (1), (2), (8), and (10) define the market equilibrium for the case of successive oligopoly power, and, given functional forms for (1) and (2), they can be solved for the endogenous variables, $P^f$, $P^w$, $P^r$, and $Q$.

For the case of successive oligopsony power, a representative processor’s profit function can be expressed as

$$\pi^w = P^w q - S(Q)q - (c^w + T)q. \quad (11)$$

The first-order condition for maximizing Eq. (11) with respect to $q$ is

$$P^w = P^f \left(1 + \frac{\theta^f}{\theta^w} \right) + (c^w + T). \quad (12)$$

Eq. (12) can be used in conjunction with the inverse farm supply curve $S(Q)$ to yield the inverse derived supply curve, $P^w = S^w(Q | \theta^f, c^w, T)$.

A representative retailer’s profit function can be expressed as

$$\pi^r = D(Q)q - S^w(Q | \theta^f, c^w, T)q - c^r q. \quad (13)$$

The first-order condition for maximizing Eq. (13) with respect to $q$ is

$$P^f \left(1 - \frac{\xi^f}{\eta^f} \right) = P^w \left(1 + \frac{\theta^w}{\theta^w} \right) + c^r. \quad (14)$$

Market equilibrium for this case is defined by Eqs. (1), (2), (12), and (14).

### 4. Simulation analysis

To conduct simulations, it is necessary to assign specific functional forms for the retail excess demand and farm excess supply functions specified in general form in equations (1) and (2). We chose linear models for this purpose:

$$Q^f = a - \alpha P^f,$$

importing country excess demand at retail,

$$P^f = b + \beta Q^f,$$

exporting country inverse farm excess supply.

In addition, we invoke the normalizations that are available without loss of generality by choosing units so that the quantity and retail price in the competitive, no-tariff equilibrium, $(Q_c, P_c)$, are each unity:

$$Q_c = 1, \ P^c = 1,$$ in which case $P^w_c = 1 - c^c$, and $P^f_c = 1 - c^r - c^w = f$ where $f$ is farmers’ revenue share under the no-tariff competitive equilibrium, and, thus $f$ measures the intrinsic importance of the farm product in producing the final product. Given the normalizations, the following relationships among the model’s parameters are readily derived:

$$a = \eta^c, \ \beta = \frac{f}{\theta^c}, \ a = 1 + \alpha, \ b = f - \beta,$$  

where $\eta^c$ is the absolute value of retail price elasticity of demand and $\xi^c$ is the price elasticity of farm supply, each evaluated at the no-tariff, competitive equilibrium.

Introducing a per-unit tariff, $T$, charged to the farm product causes supply of the farm product to the domestic-country processing sector to become:

$$P^f + T = b + \beta Q^f + T.$$

### 4.1. Equilibrium under processor oligopoly and/or oligopsony power

We consider first the case in which either the processing sector or the retailing sector may exercise oligopoly and/or oligopsony power, but the other downstream sector is competitive. Given the structure of the model, equilibrium output, farm
price, retail price, and distribution of welfare among producers, marketers (i.e., processors and retailers), and consumers are identical if the same magnitudes of market power are exercised by either the retail sector or the manufacturing sector. The same results also hold for the rather plausible case in which processors exercise oligopsony power over farmers and retailers exercise oligopoly power over consumers, but the interactions between processors and retailers are conducted under conditions of perfect competition.

For consistency with the prior section, we develop the case in which retailers behave competitively, and processors may exercise market power. Thus, \( P^w = P^r + \epsilon^r \), and we can solve (1’), (2’), and (6’) simultaneously to obtain the following equilibrium solutions for the linear model:

\[
Q_1 = \frac{1 + \alpha(\beta - T)}{\Omega_1}, \quad P_1^w = \frac{a - Q_1}{\alpha} - \epsilon^r,
\]

\[
P_1^r = P_1^r + \epsilon^r, \quad P_1^f = b + \beta Q_1,
\]

where \( \Omega_1 = (1 + \xi^w) + \alpha + \theta^r \alpha \beta = (1 + \xi^w) + \alpha + \theta^r \xi^w / \xi^r \). The expression \( \Omega_1 \) measures the total distortion due to oligopoly and oligopsony power in the linear model, and \( Q_1 < 1 = Q_r \) whenever either \( \theta^r \) or \( \xi^w \) is positive.

Fig. 1 illustrates the model. It relies on Melnick and Shalit’s (1985) observation that an industry with oligopoly power acts as if it faces a perceived marginal revenue (PMR) curve that consists of a linear combination of the monopoly marginal revenue curve, \( MR(Q) = \partial[D(Q)Q]/\partial Q \), and the market demand curve, \( D(Q) \), with \( \xi \) representing the weight attributed to the marginal revenue curve and \( 1 - \xi \) representing the weight attributed to the demand curve: \( PMR(Q) = \xi MR(Q) + (1 - \xi) D(Q) \).

Similarly, for an industry with oligopsony power, the perceived marginal factor cost curve is

\[
\text{PMC}(Q) = \theta MC(Q) + (1 - \theta) S(Q),
\]

where \( MC = \partial[S(Q)Q]/\partial Q \) denotes the monopoly marginal factor cost curve. Industry equilibrium output, \( Q_1 \), is found in Fig. 1 at the intersection of the PMR\(^w\) and PMC\(^w\) curves. The competitive equilibrium, output \( Q_1 \) in Fig. 1, is the special case where \( \xi^w = \theta^r = 0 \).

Economic surplus (ES) under processor market power is distributed as follows:

\[
CS_1 = \int_{P_1^r}^{a/\alpha} (a - \alpha P)dP = \frac{(a - \alpha P_1^r)^2}{2\alpha} \quad \text{consumer surplus},
\]

\[
PS_1 = \int_b^{P_1^f} P - b dP = \frac{(P_1^f - b)^2}{2\beta} \quad \text{producer surplus},
\]

\[
\Pi_1 = \Pi_1^r + \Pi_1^f = [P_1^f - P_1^r - 1 + f - T]Q_1 \quad \text{processor/retailer profit},
\]

\[
R_1 = TQ_1 \quad \text{tax revenue},
\]

\[
ES_1 = CS_1 + PS_1 + P_1 + R_1 \quad \text{total surplus}.
\]

Given the constant-cost characterization of the marketing sector (processing and retailing), the sector earns zero profits in competitive equilibrium: \( \Pi_1 = 0 \).

In the linear version of the model, the market equilibrium prices, output, and distribution of economic welfare are determined by six parameters: \( \xi^w \) (seller oligopoly power), \( \theta^r \) (buyer oligopsony power), \( \eta^w_R \) (price elasticity of retail demand evaluated at the no-tariff competitive equilibrium), \( \epsilon^c_r \) (price elasticity of farm supply evaluated at the no-tariff competitive equilibrium), \( f \) (farm revenue share in the no-tariff competitive equilibrium), and \( T \) (magnitude of the per-unit tariff). In this model, the per-unit tariff functions identically to the constant per-unit costs, \( \epsilon^r \) and \( \epsilon^w \), incurred by retailers and processors, respectively. The larger is \( T \), ceteris paribus, the less important is processor oligopsony power as a factor in determining the market equilibrium. Intuitively, \( T \) represents an additional wedge (along with processor and retailer costs) between consumers and farm producers. When the farm input price is a small component of retail value, the structure of the market for procurement of the input does not matter much in determining the market equilibrium at retail.

### 4.2. Market power at successive vertical stages

We focus on the case of successive oligopoly power. For the linear version of the model, the market equilibrium under successive oligopoly power is defined by Eqs. (1’), (2’), (8), and (10):

\[
Q_2 = \frac{1 + \alpha(\beta - T)}{\Omega_2}, \quad P_2^w = b + \beta Q_2 + \epsilon^w,
\]

\[
P_2^r = \frac{a - Q_2}{\alpha}, \quad P_2^f = b + \beta Q_2,
\]

where \( \Omega_2 = (1 + \xi^w)(1 + \xi^w^r) + (1 + \theta^r \alpha \beta = (1 + \xi^w)(1 + \xi^w^r) + \theta^r \xi^w / \xi^r \). This in the case the market equilibrium and welfare distribution are determined by seven parameters: \( \xi^r, \xi^w, \theta^r, \theta^r, \epsilon^c_r, f, \) and \( T \). In addition to the parameters contained in the preceding case, a second \( \xi^r \) parameter reflects the degree of seller market power at successive stages of the marketing chain. Fig. 2 illustrates this scenario. The curve \( PMR^r = PMR - \epsilon^r \) represents the retailer sector’s derived demand for the farm product at the wholesale level, given the retailers’ oligopoly power, \( \xi^r \). Where \( PMR^r = \xi^r MR(Q) + (1 - \xi^r) D(Q) \). Processors then recognize a PMR curve, \( PMR^w \), based on \( P^w \), given their oligopsony power, \( \xi^w \). The reduction in output from \( Q_1 \) to \( Q_2 \) in Fig. 2 represents the incremental distortion to output from successive oligopsony power.\(^{14}\)

\(^{14}\) The formal derivation of the successive oligopsony case is a straightforward adaptation of the successive oligopoly case and, thus, is omitted. The linear version of the successive oligopsony model is represented by Eqs. (1’), (2’), (12), and (14), and the model solution is characterized by seven parameters, with the additional parameter in this case reflecting the possible exercise of oligopsony power by processors in the market for the farm product, \( \theta^r \), and by retailers in the wholesaler market, \( \theta^w \).
In structuring simulations for these various competition scenarios, we have chosen base parameter values to resemble some key developing-country export scenarios. The parameter \( f \), the farm share of revenue under the no-tariff competitive equilibrium, was fixed at \( f = 1 - c^w - c^r = 0.2 \). For example, farm share for coffee and bananas is about 10% (FAO, 2004) and for cocoa about 5% (Oxfam, 2002). In the market power and tariff scenarios contained in the simulations, the farm share drops well below the 0.2 competitive-benchmark share, so setting the benchmark at 0.2 enables the simulations to depict the even lower shares observed in reality.15

The primary effect of \( f \) in the model is to influence the importance of oligopsony power in determining output and welfare in the market. When \( f \) is small, the farm input is not important as a determinant of the final product value relative to the costs incurred by processors and retailers, and, thus, oligopsony power in the farm sector has only a minor impact on total market output and consumer welfare. The presence of a tariff diminishes the farm share of the total retail expenditure under any form of competition, and, thus, also reduces the relative importance of processor oligopoly power in determining the market equilibrium.

We consider \( \eta^r = \theta^r = 0.6 \) as base cases for the retail-demand and farm-supply elasticities, respectively, each evaluated at the no-tariff competitive equilibrium.16 The choices reflect the inelasticity of both consumer demand and farm supply that is considered typical for agricultural commodities.17 For example, Bhuyan and Lopez (1997) report price elasticities of demand for roasted coffee and chocolate and cocoa in the U.S. of 0.53 and 0.52, respectively. Abbott et al. (2005) report an aggregate price elasticity of demand of 0.24 for bulk cocoa and 0.53 for fair-trade cocoa products. The former number compares closely to the estimate of 0.19 reported by Gilbert and Varangis (2003). In terms of supply elasticities, Abbott, et al. report short-run price elasticities of supply in the range of 0.3–0.5 for cocoa, a range that comports well with the point estimate of 0.45 reported by Gilbert and Varangis (2003).

---

15 To provide just one illustration of this point, the farm share of the consumer food dollar for the case of modest successive market power represented by \( \xi^w = \xi^r = 0.2 \) is 0.071%, given the base competitive markets share of \( f = 0.2 \), precisely in the range indicated for key developing-country export commodities.

16 The distortion from a given degree of market power is always proportional to the elasticity of the demand curve (in the case of oligopoly power) or supply curve (in the case of oligopsony power) that is being exploited. Setting \( \eta^r = \epsilon^r \) has the virtue that the relative importance of oligopoly vs. oligopsony power is not distorted by differences in the underlying elasticities of retail demand or farm supply.

17 Given \( \epsilon^c = 0.6 \) and \( f = 0.2 \), the retail supply elasticity evaluated at the competitive equilibrium is \( \epsilon^c = 3.0 \).
Given the linear retail supply and farm demand curves, the elasticities change as output changes along the curves to reflect alternative forms of imperfectly competitive equilibria. However, the relative magnitudes of alternative elasticity specifications are the same across the various imperfect competition equilibria, and, thus, it suffices to fix the elasticities at a particular point, such as the competitive equilibrium, to simulate the effects of alternative elasticity specifications.

The most important parameters for the purposes of the simulation analysis are the market power parameters, $\theta$ and $\xi$. As noted and illustrated in Table 1 most empirical estimates have revealed rather modest departures from competition, with point estimates of $\theta$ and/or $\xi$ falling typically in the range of 0.25 or less (Sheldon and Sperling, 2003). However, Bhuyan and Lopez (1997) obtained estimates of $\xi$ that were considerably higher for some industries in their ambitious study of oligopoly power for all U.S. four-digit SIC food and beverage industries. For example, 2043 cereal preparation, 2041 flour & grain mills, 2075 soybean oil mills yielded estimates of $\xi$ of about 0.5.

Given the recent increases in consolidation of food manufacturing and food retailing in many countries, the past studies may understate current levels of market power. In addition, Sexton (2000) has argued that the limitations of the extant empirical literature probably serve on balance to understate the extent of market power. For example, this conclusion would apply to (i) analysis of inappropriately broad product markets, (ii) failure to account for the possibility of market power upstream or downstream from the stage being analyzed, and (iii) failure to account properly for technical change and/or economies of scale in costs.

Thus, to gain a broad perspective of the effects of market power on the impacts of tariff reduction, we conduct simulations over the interval $\theta, \xi \in [0, 0.5]$. However, to facilitate a graphical presentation of results, we always consider equal relative departures from competition for each sector that is exercising market power in the simulation. For example, in simulating market behavior under successive oligopsony and retailer oligopoly, we will always set $\theta^f = \theta^w = \xi^r$.

### 4.3. Simulation results

It is first useful to gain a perspective as to how market power, including market power at successive vertical stages, can affect market performance. Fig. 3 depicts the effect of market power on producer welfare as the% change in producer welfare relative to perfect competition as a function of the degree of downstream market power. Five market power scenarios are considered: (i) oligopsony only, (ii) both oligopoly, and oligopsony, (iii) successive oligopsony and retailer oligopsony, and (iv) successive oligopoly and processor oligopsony.

---

18 Values of 0.5 for $\xi$ and $\theta$ indicate the market power obtained in a symmetric firm duopoly and duopsony, respectively.
A given degree of downstream oligopoly power is always more damaging to producer welfare than the same degree of downstream oligopsony power because the oligopoly power affects the entire final product, whereas the oligopsony power applies only to the raw product input.\footnote{In the base simulation, the farm share of the final product value under perfect competition is 0.2, and, thus, the other inputs used by the marketing sector to produce the final product constitute 80% of the retail value under perfect competition. These inputs implicitly are assumed to be acquired competitively.} Thus, \textit{ceteris paribus}, a given degree of oligopoly power will always reduce market output more than will a given degree of oligopsony power. Fig. 3 makes clear that, even modest levels of market power, such as have been found in the empirical literature, can in combination have a very damaging impact upon the welfare of producers in the developing economy. For example, successive oligopoly power combined with processor oligopsony power of 0.2 ($\xi^r = \xi^w = \theta^f = 0.2$) combine to reduce producer surplus by about 49% relative to perfect competition in all downstream sectors.

Fig. 4 illustrates the effect of downstream market power on total ES (the sum of producer surplus, consumer surplus, and marketer profits) in the market. Fig. 5 illustrates the distribution of ES among producers, consumers and marketers for the case of processor oligopsony combined with retailer oligopoly (but no successive market power). Figs. 4 and 5 combine to illustrate some important points regarding the efficiency and distributional impacts of market power in a vertical market chain. First,
modest levels of market power have small efficiency effects. Fig. 4 shows that even successive oligopoly plus oligopsony or successive oligopsony plus oligopoly generate efficiency losses relative to perfect competition of 10% or less for modest levels of market power—θ and ξ values of 0.2 or less, results consistent with prior work, dating back to the original work by Harberger (1954). However, Fig. 4 also illustrates that markets with large departures from competition that are repeated across multiple vertical stages can have large efficiency losses. For example, the case of successive oligopoly plus oligopsony where ξ_r = ξ_w = θ_f = 0.5 (i.e., Cournot duopolies and duopsony) reduces the total ES in the market by about 28%.

Fig. 5, however, shows that the distributional effects of market power are large even for modest departures from competition. Perfectly competitive marketers earn only normal profits in this model, but ξ_r = θ_f = 0.2 or more enables the marketing sector’s surplus to exceed the surplus earned by the producing sector, and ξ_r = θ_f = 0.4 or more enables marketers’ surplus to exceed consumers’ surplus.

Now consider trade liberalization in terms of eliminating the per-unit tariff \( T = 0.2 \) (a 20% tariff at the competitive equilibrium). Fig. 6 depicts the absolute change in farm price from removing the tariff for alternative competition scenarios. Given \( \epsilon_c' = 3 > \eta_r = 0.6 \), producers bear only one sixth of the incidence of the tariff in competitive equilibrium. Thus, abolishing the tariff raises the farm price by \( \Delta P_f = 0.2/6 = 0.033 \) in the competitive equilibrium. \( \Delta P_f \) 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. For example, in the case of successive oligopoly power plus processor oligopsony, modest market power represented by \( \xi_r = \xi_w = \theta_f = 0.2 \) reduces the farm price increase from tariff removal by 29%, while the more extreme scenario of \( \xi_r = \xi_w = \theta_f = 0.5 \) reduces the price increase by 53%.

The effect of market power on the increase in producer welfare caused by trade liberalization depicted in Fig. 7 is more pronounced than the effect on price, because producer surplus is determined both by the change in farm price and the change in output, and market power diminishes both. Consider again the case of successive oligopoly plus processor oligopsony power. The modest market power case represented by \( \xi_r = \xi_w = \theta_f = 0.2 \) reduces the producer surplus increase from trade liberalization by 48%, while \( \xi_r = \xi_w = \theta_f = 0.5 \) reduces it by 78%.

Next consider the distribution of benefits from trade liberalization across producers, consumers, and marketers depicted in Figs. 8 and 9. Fig. 8 represents the case of processor oligopsony and retailer oligopoly, while Fig. 9 represents successive oligopoly plus processor oligopsony. Producer and consumer welfare both decline monotonically in the degree of market power exercised. Marketers’ profit rises monotonically as a function of \( \xi_r = \theta_f \) in the case of simple oligopoly and oligopsony power illustrated in Fig. 8, but marketers’ profit actually declines in the successive-oligopoly-plus-oligopsony case (Fig. 9) for high values of \( \xi_r = \xi_w = \theta_f \), illustrating an important feature of market power generally and of successive market power in particular. Agents who exercise market power always impose a negative externality on the other participants in the market. A straightforward manifestation of this phenomenon is the declining surplus to producers and consumers as a function of marketers’ power. In the successive market power case, rising values of \( \xi_r = \xi_w = \theta_f \) represent higher absolute levels of market power exercised by marketers, but the negative externality.

![Fig. 5](image-url)
imposed on processors’ profits when retailers increase their market power (and vice versa) can dominate the higher profits earned by the retailer, causing overall marketing sector profits to fall for high levels of market power exercised at successive stages.\textsuperscript{20} Both Figs. 8 and 9 demonstrate that the distributional effects of 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, when market power occurs at successive stages of the market chain, as illustrated in Fig. 9, even rather modest levels of market power at each stage enable the marketing sector to capture 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.

5. Extensions

Many extensions and generalizations of this simulation framework are possible, and we mention only a few here. First, the results discussed here are conditional upon the base values
analysis holding the demand elasticity constant at the base $\eta_c^* = 0.6$ and alternatively setting the competitive-equilibrium supply elasticity at 0.3, 0.6, and 1.2.

Changing the base value of the one elasticity while holding the other elasticity constant introduces two effects: (i) the impact on farm (retail) price due to oligopsony (oligopoly) power increases as supply (demand) becomes more inelastic; (ii) the relative incidence of the tariff on producers and consumers changes as the relative values of the elasticities change. For example, the incidence of the tariff on producers increases as supply becomes more inelastic, and, thus, holding market power constant, producers benefit more from removal of the tariff via trade liberalization in these settings. This incidence
effect is manifest in Fig. 11 (10) in terms of $\Delta PS$ from trade liberalization being greater for any values of market power the less (more) elastic is the supply (demand) curve.

Whereas a competitive marketing sector with a constant-returns technology bears none of the incidence of the tariff, downstream firms with market power always rationally absorb a portion of any increase in their costs, including the cost of a per-unit tariff, so as to distribute optimally the impact of the cost increase between lower quantities and higher prices. The fraction that is absorbed is an increasing function of the degree of market power. For example, when $\theta = \xi = 0.5$, the marketing sector absorbs one-third of the tariff regardless of the base values of $\varepsilon_f$ and $\eta_r$.\(^{21}\) Therefore, the magnitude of the total benefit from trade liberalization to be divided between

\[^{21}\]To say that downstream firms with market power rationally bear some of the incidence of a tariff is the equivalent of saying that they capture some of the benefit from abolition of the tariff.
developing-country producers and industrialized-country consumers is reduced as a function of downstream firms’ market power. This fact is illustrated in Figs. 10 and 11 in terms of $\Delta PS$ from trade liberalization declining in all instances as a function of the degree of downstream market power. The impact of market power on the benefits from trade liberalization is naturally more severe on the sector (consumers or producers) bearing a greater incidence of the tariff. Thus, the slope of the $\Delta PS$ curves in Figs. 10a and 10b is steepest for the cases where producers bear the brunt of the tariff’s incidence ($\varepsilon_f^c = 0.6$, $\eta_r^c = 1.2$ in Fig. 10, and $\varepsilon_f^c = 0.3$, $\eta_r^c = 0.6$ in Fig. 11).

The effects of a larger farm share on the producer benefits from trade liberalization for alternative levels of market power are illustrated in Fig. 12. Two effects are at work. The producer benefit under perfect competition from removal of the tariff is greater the larger is the farm share, $f$, and, accordingly, the potential for loss in producer benefit from market power is greater as well. Second, the impact of oligopsony power on producer benefits is magnified the more important the farm input is in determining the final product. Both factors, thus, contribute to a greater loss in producer benefits from trade liberalization due to market power the higher is the base farm share.

Next, consider the question of whether a developing country can increase ES by integrating downstream into the processing of its agricultural product. Working against the viability of developing-country integration is the possibility that processing in the developing country will be less efficient (i.e., incur higher costs) in producing processed or semiprocessed products than processors in developed countries.\textsuperscript{22} However, offsetting any cost penalty is that home-country processing removes the exporting country’s exposure to oligopsony power by importing-country processors, enhancing the appeal of vertical integration.\textsuperscript{23}

Fig. 13 gives a sense of the interplay between these offsetting factors. It depicts iso-welfare lines—welfare-neutral combinations of the processing sector’s higher per-unit processing costs, $\Delta c^w$, on the vertical axis incurred by the developing country and levels of oligopsony power, $\theta$, on the horizontal axis in the importing country’s processing sector that is avoided by downstream integration. We assume that developing-country integration removes the production sector’s exposure to processor oligopsony power, but that any market power exercised further downstream by the importing country’s retailing sector remains.

Two alternative scenarios for retail sector market power are depicted in Fig. 13: (i) on the top line, the retailing sector exercises both oligopsony and oligopoly power in a magnitude that is equivalent to the oligopsony power exercised by the importing country’s processing sector (and avoided by downstream institutions, and limited human capital as key competitive disadvantages faced by developing-country manufacturers.

\textsuperscript{22} Tybout (2000) is an excellent source on the distinctive features affecting the manufacturing environment in developing countries. He cites onerous regulations, credit market imperfections, underdeveloped infrastructure and

\textsuperscript{23} The processing sector that evolves in a developing economy may itself be oligopsonistic, but at least the oligopsony profits may be captured locally, e.g., the Mozambique cashew nut case (McMillan et al., 2000). Processor oligopsony power is also an issue when processing is undertaken by multinational firms through direct foreign investment. Downstream processing is most beneficial to the developing economy if it takes place under conditions of perfect competition. For example, in Nigeria, the cocoa marketing sector is characterized by many local exporters, which contrasts with the Ivory Coast where multinational exporting firms dominate (Wilcox and Abbott, 2004). One way to induce competitive behavior in the processing sector is to organize it around zero-profit, producer-owned cooperatives, which in the context of the present model results in an equilibrium that is analytically equivalent to the competitive equilibrium.
integration), and (ii) on the bottom line, the retailing sector exercises only oligopoly power that is equivalent to the processing sector’s oligopsony power. For example, in a setting of successive oligopsony power plus oligopoly power in the downstream processing and retailing sectors of magnitude $\theta_f = \theta_w = \xi_r = 0.3$, a developing country could improve its economic welfare by undertaking processing of its raw material and thereby avoiding processor oligopsony power, as long as its processing cost penalty is 0.15 (relative to total processing plus retailing costs of 0.8 for the developed economy in the base simulation) or less. All points below an iso-welfare line in Fig. 13 represent combinations of processing cost penalty and oligopsony power where the developing economy enhances its economic welfare by integrating into the processing sector despite incurring the cost penalty, given the extent of processor oligopsony power it avoids by doing so.24

Finally, we have modeled the case of a constant per-unit tariff or export tax, but many tariffs are *ad valorem*. Simulating the impacts of removing an *ad valorem* tariff would add some complications to the modeling relative to a per-unit tariff. In particular, because the *ad valorem* tariff affects the slope of the downstream supply functions derived from the farm supply function, the simple proportional relationship between price elasticity at the farm level and at retail ($\varepsilon_f = \varepsilon_r / f$), that holds for the per-unit tariff, does not hold for the *ad valorem* tariff. Indeed, an *ad valorem* tariff makes the downstream supply relationships less elastic, *ceteris paribus*, and, thus, can exacerbate the distortion from oligopsony power in the retailer–processor interaction. Removing the tariff actually reduces the distortion from a given degree of retailer oligopsony power, which provides an additional welfare benefit from trade liberalization.

6. Summary and conclusions

Taken together, the vertically related, highly concentrated nature of the food sector in developed countries raises many issues for developing countries attempting to increase market access and the returns from exporting agricultural and food products. Policymakers and economists have mostly ignored these issues when they provide estimates about what further trade reform may bring to developing countries. Consequently, to fully understand the implications of trade reform for raw commodity exporters, further attention needs to be paid to the issue of imperfect competition in developed-country food markets.

In this context, two key implications can be drawn from this article. First, if developing country exporters face a marketing system characterized by a structure of successive oligopoly/oligopsony, reduction of import tariffs, while increasing raw commodity prices, will not result in exporters obtaining a larger share of the consumer’s food “dollar” in developed countries. This conclusion follows from the fact that firms with market power in the food retailing and processing sectors are able to capture most of the benefits of a reduction in the tariff on the imported raw agricultural commodity. This implies that developing country exporters will benefit less from trade liberalization by developed countries than is being forecast by development agencies such as the World Bank (2003), and non-governmental organizations such as Oxfam (2003). However, a corollary to this result is that export taxes will be borne in part

---

24 The range of parameter combinations where exporting-country integration are beneficial is greater for the case of successive oligopsony and oligopoly. The distortions caused by market power are convex in the total magnitude of market power exercised. Thus, removing a layer, processor oligopsony, has a greater benefit, the greater the magnitude of market power exercised further downstream.
by marketing firms with market power and, thus, represent a potential tool for developing countries to extract rents from an oligopolistic and/or oligopsonistic marketing sector.

Second, increasing concentration and reduced competition in the food processing and retailing sector will reduce even further the share of commodity exporters in the available rents in the food marketing system. This conclusion generates the key policy implication that developing country exporters may benefit from vertically integrating into food processing and other value-adding activities further down the vertical marketing chain, in order to capture more of the rents from trade liberalization. This outcome holds despite the possibility that developing countries may suffer a cost disadvantage in food processing.

Acknowledgements

We would like to acknowledge the helpful comments of two anonymous reviewers on earlier versions of this article, along with comments of audience members at the IATRC theme day, San Antonio, Texas, the AAEA meetings, Denver, Colorado, and seminars at Ohio State and North Carolina State Universities where the article was presented. Thanks are also due to Tina Saitone, University of California, Davis, for her invaluable research assistance. Ian Sheldon would also like to acknowledge financial support through a grant from the Food System Research Group at the University of Wisconsin, Madison.

References


