Strategic Behavior and Trade in Agricultural Commodities – Competition in World Peanut Markets

Stanley FLETCHER
D. NADOLNYAK

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Introduction

In the paper, we offer a simple welfare analysis of the likely consequences of the recent trade reforms and policies in an attempt to rationalize the strategic behavior of major peanut exporting and importing countries in the framework of imperfectly competitive markets with the focus on the global and inter-American peanut trade. This study is motivated by the fact that, while the trend towards liberalization of agricultural trade is supposed to be welfare enhancing, liberalizing imperfectly competitive and often distorted markets can increase the incentives of the trade participants to overuse the still available trade policies. At the same time, certain distortionary trade policies can be welfare enhancing in imperfectly competitive markets by correcting for the history of suboptimal production and strategic interactions.

While complicated nature of peanut trade policies prevents exact modeling, outlining a few notable features help correctly choose among more general trade models that can be used in the analysis. While most of the world peanut production is consumed domestically, a few countries do export a sizeable share of their production. Production for export is concentrated mainly in South-East Asia (China, India, and Vietnam) and South America (Argentina and Mexico). Generally, the exporters enjoy both cost *and* comparative advantage in peanut production. The main importers of edible peanuts are the EU, Japan, the U.S., and Canada. The U.S. is probably the only country that both exports and imports peanuts, most likely due to their differentiated nature.

The main trend among peanut importers has been that of lowering import tariffs and duties under the WTO rules. Besides, peanut tariffs within the NAFTA and FTAA are even lower and member countries enjoy preferential treatment by the U.S., the main American importer.

As for production subsidies, only the U.S. has been consistently supporting its peanut production via the supply management policies and later by the Marketing Loan Program. While these supports do not exactly qualify as production (or export) subsidies, the marketing loan program (and counter-cyclical payments) effectively subsidizes production when the prices are low. Production supports are increasingly limited by the multi-lateral WTO agreements on agricultural policies, so that it is safe to assume that there is a trend towards lowering production supports. Little is known about agricultural support policies in China, but there are reasons to believe that its government can subsidize production for strategic reasons. The rest of peanut exporters do not offer any significant production or export supports.

An important peculiarity of the peanut (and other agricultural) trade reforms is that they are taking place in largely imperfectly competitive markets that have been distorted by protectionist trade policies. Imperfect competition is likely to exist on both the national level in many countries with concentrated processing and exporting industries, and on supra-national level, whereby governments engage in strategic trade policies.

In analyzing the world peanut trade, we distinguish competition by exporters for an import market (the U.S. and the South American peanut producers compete with the Asian producers and each other for the EU and other import markets) and competition among producers that trade with each other, exemplifying the inter-American peanut trade as a sub-sector because peanuts are produced in the South and North America and because the NAFTA and FTAA countries enjoy preferential treatment within the region. For analyzing competition for exports, we use the Brander-Spencer model of Cournot-Nash equilibrium with optimal subsidies (Brander and Spencer, 1985). For analyzing regional intra-industry trade, we employ a model of segmented markets with free entry described in Dixit (1984). Overall, our findings are

consistent with the basic conclusions of the trade theory that liberalizing imperfectly competitive markets has ambiguous effects and is not necessarily welfare improving.

Brief Overview of World Peanut Production and Trade

The world peanut **production** has been increasing since the 1970s, mostly due to increasing yields and increased demand for peanut food products. The leading world peanut producers in 2001-3 were China (45% of the world production), India (19%), followed by the US (5.2%), Nigeria (4.7%), and Indonesia (3.3%). The main world peanut producing regions can be divided into the Americas, Africa, and Asia, (Revoredo and Fletcher, 2003 a). Within the Americas, the North American production has increased by about 14%, while production in the South America has decreased by 24.1%, mostly in Brazil (Lee, Kennedy, and Fletcher, 2005). In Africa, production increased tremendously in the western region (Chad and Nigeria), while Eastern and South African production fell. Most of the growth in the world production occurred in Asia (163% since 1972-1975), mainly due to Chinese production increase of 563%, reaching 14.6 mil tons in 2001-2004.

Peanut **consumption** is almost evenly divided between edible purposes (42.3% in 2001-2004) and crushing for meal and oil (48.6%). Peanuts represent about 10% of world production of oilseeds (after soybeans, cottonseed, and rapeseed). North American consumption has increased by 52% mainly due to edible uses, while the South American consumption declined (though edible use increased), making the export market more important for the South American producers.

The world peanut **trade** can be considered a residual market, as most of the production is consumed domestically. Average share of exports in the total world production has been about 5% since the 1970s, while the total volume has been growing from 1.1 to 1.8 mil m etric tons. Most of the U.S. production is consumed domestically – only 6% of the domestic production was exported in 2001-3.

The world's major peanut **exporters** are China (49% of global exports in 2001-3), the U.S., Argentina (13%), India (7%), Vietnam (5%). The major peanut **importers** are the EU (38%), Japan (8.5%), Indonesia (7.6%), Russia (7.4%), Canada (7%), Mexico (6.6%), and the US (4.9%). Of these, only the US appears to be both importing and exporting peanuts in significant volumes.

Peanuts are more differentiated than staple crops like soybeans, corn, or wheat, as they differ not only by grades, but also in quality (particularly aflatoxin content). This differentiation is reflected by price differences according to the country of origin (Revoredo and Fletcher, 2003b).

The trend among the importers in the EU and the South-East Asia has been to lower or eliminate import duties and (in-quota) tariffs. The U.S. replaced import quotas with tariff rate quotas with 9.35c/kg for in-shell and 6.6c/kg for shelled in-quota rates, the over-quota tariffs being prohibitively expensive. The major exporters of peanuts to the U.S. in 2003 were Argentina, Mexico, and China. However, these countries have not been treated equally (see below).

2. Models of Trade with Imperfect Competition and Discussion of Their Applicability to the World Peanut Trade.

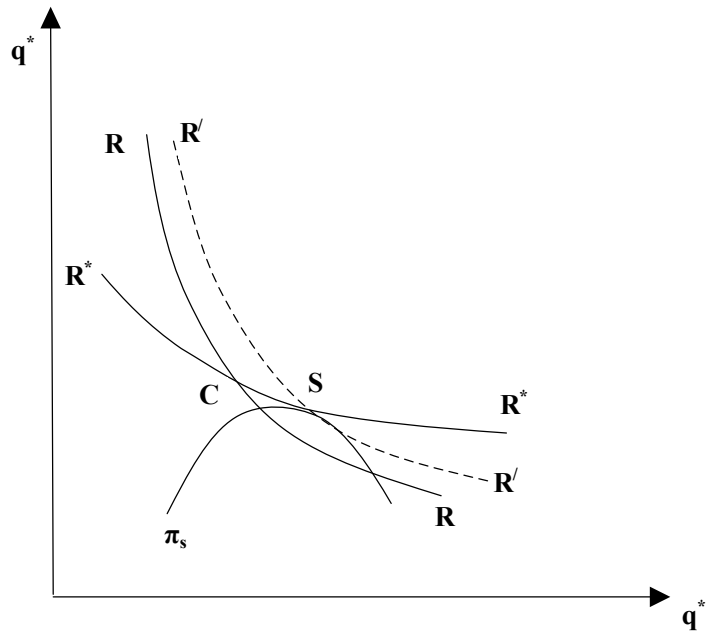
In this section, we consider two distinct classes of models of trade with imperfect competition. One is the Brander-Spencer (1985) type of models that assume countries producing for exports only and competing in an import market. The other class of models considers bilateral trade flows between countries that both consume and trade their produce with each other. As argued above, the first class of models applies to the case of major peanut exporters competing for the import market (mainly the EU and the U.S.), while the second corresponds to the bilateral inter-American trade (US - South America). Due to size limitations, the model presentations have been shrunk.

2.1. Countries producing for exports only

2.1.1. *Cournot competition*.

The conventional models show that export subsidies (or production subsidies in the absence of domestic consumption) benefit the subsidizing country's industry, and therefore reciprocal subsidies result when there are several countries producing only for export. It is important that this logic does not require specific assumptions about the cost function, the only assumptions being behavioral.

In its simplest form, the Brander-Spencer (1985) model is as follows. Assuming two countries producing a certain homogeneous good for export in a third country, a Nash-Cournot equilibrium in the absence of government intervention is defined by the intersection of the two curves defined by point C in the figure below:



While the logic of the Cournot equilibrium has been the subject of much controversy (the "dynamic" adjustment argument being intuitively appealing but contradicting the one-shot nature of the game), empirical research shows that it is a robust concept nevertheless (Dixit, 1986).

An optimal per unit export/production subsidy *s* decreases the domestic per unit costs shifting the domestic reaction function to the right to the point where home iso-profit curve is tangent to the foreign reaction curve (point *S*, a Stackelberg outcome for the home country). The home profits rise to π_s, while foreign profits fall. Thus, the home country benefits from the subsidy by shifting profits away from the foreign country, which is worse off due to the fact that outputs of the two countries are strategic substitutes. Normally, the cost of the subsidy is more than offset by the gain in profits and the subsidy expands domestic output more than it contracts the foreign production, which benefits the importing country through an improvement in the terms of trade. The joint welfare of the exporters is inferior to the no-subsidy case. However, in presence of a significant competitive fringe, the change in the terms of trade becomes less important making the subsidy argument stronger. Badyopadhyay (1997) shows that, in a

symmetric two-country model, the optimal policy is a subsidy, no intervention, or export tax if the demand is elastic, unit elastic, or inelastic. In a simultaneous-move Nash game with asymmetric costs and elastic demand, the high-cost country subsidizes its production at a lower rate than the low-cost country.

In the case of **many firms** producing a given product, the model does not change significantly (Dixit, 1986). An important feature of the multi-firm model above is that it is more likely that a subsidy is larger in a country with fewer but larger firms.

Applying this logic to peanut production for export, one can argue that, in order to increase their market share and apart from domestic consumption considerations, major exporters with both cost and comparative advantages have an incentive to subsidize their production as it increases their profits allowing them to make more of the cost advantage. While the demand in the major importing countries is not always elastic (according to most recent estimates in Beghin, and Matthey, 2003), the aggregate import demand elasticity is likely to be greater than one, which leads to bilateral subsidizing of domestic exports. It is possible that further reductions in tariffs and quotas will make demand even more elastic and thus increase the low-cost producer incentives to subsidize even further.

While the strategic subsidy argument may not hold for poor countries, the largely centrally planned economies with small production costs, most notably China, may indeed stand to benefit from subsidizing their export production, which permits taking more advantage of their lower costs, thus hurting other exporters but benefiting the consumers. On the one hand, the Chinese gradual transition to a market economy has been marked by a rather sharp reduction in the state support of agriculture, which caused its temporary decline (Rozelle and Swinnen, 2004). On the other, the government there is still in a position to redistribute national income among

production sectors using various means that may not be easily detectable (Diop, Beghin, and Sewadeh, 2004). China's 49% share in the global peanut exports makes this strategic consideration important.

Overall, models of for-export production with Cournot-Nash behavior suggest that countries with smaller production costs, larger export shares, and more concentrated production have more incentives to subsidize their exports. As a rule, export subsidies benefit the importers but hurt the exporters through the terms-of-trade effect.

2.1.2. ***Bertrand competition***

If the home and foreign countries produce differentiated products, they might just as well be engaged in **Bertrand** competition, choosing prices instead of quantities (Eaton and Grossman, 1986). The general result of the Bertrand model is that the home government can increase its industry's profits by committing to an export *tax* due to strategic complementarity.

Whether Cournot or Bertrand competition is a more realistic assumption depends on a number of factors. Whether the exporting countries/firms set prices rather than choose production quantities depends on the actual price discovery mechanism: acceptable bargaining strategies, how long the prices are negotiated, sellers' asking prices, *etc*. However, the Bertrand competition has usually been considered more anti-competitive.

2.2 Trade with Domestic Consumption

This setup corresponds to regional trade patterns, such as trade between the North and South Americas within the NAFTA (FTAA). The most elementary case of oligopoly models that accommodate consumption as well as production is a model of segmented markets described in

Dixit (1984). The model assumes two countries, domestic and foreign, homogeneous products, constant marginal costs, and linear demands. The available trade policies considered are:

- a tariff t imposed by the home country on the foreign imports;
- a domestic subsidy s_q on home sales to domestic firms;
- an export subsidy s_q^* by the foreign country to its firms.

Dixit's analysis suggests that, just like in the case of two firms competing for exports to a third (importing) country, a **unilateral subsidy on home sales** raises the domestic and total output and lowers the foreign output. A **unilateral tariff** raises home output and lowers the foreign and total output. Finally, an **export subsidy** by the foreign government lowers home output and raises the foreign and total outputs. The welfare implication of this is that a net effect of home sales subsidy is an increase in supply which lowers the price and thus increases the domestic consumer surplus. The effect on home profits is ambiguous (as output rises but the price falls), but the aggregate welfare is positive. This effect is identical to the model of exclusively export production with multiple firms.

The domestic profit maximizing *tariff* is positive, zero, or negative if the number of home firms is smaller, equal to, or larger than the number of foreign firms plus one. That is, the tariff sign and magnitude varies with the level of home oligopoly: the more concentrated the domestic industry, the higher the profit maximizing tariff. The tariff's impact on welfare is ambiguous, as it also reduces the consumer surplus, and the tariff revenue normally rises for low initial values but decreases thereafter. The foreign *export subsidy* raises total domestic consumption and imports but lowers domestic production, thus increasing the consumer surplus but cutting the domestic profits.

When both production subsidy and tariff are available as policy instruments and the demand is linear, it is optimal to subsidize domestic production and not to import when the home costs are lower. There is no need for the tariff, as the optimal home production subsidy equates price to the (lower) home costs and thus ousts the imports. When the foreign country has a cost advantage, it is still optimal to subsidize and also to impose a positive tariff in order to increase revenue and offset the loss in profits. The net effect of the subsidy and tariff on welfare of the higher cost firm is positive.

These results suggest that, when both tariffs and subsidies are available to the governments as trade instruments, both importing and exporting countries within a trading block have an incentive to subsidize production for domestic consumption. Moreover, it is in the interest of the welfare of the country with higher costs (inevitably the importer) to also impose a tariff on the (cheaper) imports.

When **only one of the two instruments** (subsidy or tariff) is available, sub-optimal outcomes ensue in the sense that they are not as welfare enhancing for the country administering them as when both instruments are available. A positive **home sales subsidy** is still (individually) optimal regardless of the cost asymmetry. However, when the home country has higher costs, the subsidy also substitutes for the (unavailable) tariff and thus the equilibrium domestic price is in between the domestic and foreign marginal costs. When only a **tariff** is available, it is optimal to impose it on imports if the home country has a cost advantage, in which case the domestic price is above the costs but imports are still restricted. If the home country's costs are higher, the magnitude of the tariff is greater than when the subsidy can be used.

As for the **foreign subsidy**, its impact on the home welfare is ambiguous, as it lowers the price thus increasing the consumer surplus but also reduces domestic output thus reducing the

profits. However, home welfare unambiguously rises with the foreign subsidy only when the share of imports is larger than the share of home firms' production in domestic consumption, as it implies smaller home profit loss.

Considering the **foreign welfare**, the optimal foreign export subsidy varies proportionately with the level of foreign industry concentration. The effect of the home sales subsidy on the foreign welfare is negative as it lowers foreign exports and expands domestic consumption, thus lowering the price. The effect of the home country's import tariff on the foreign country's welfare varies proportionately with the ratio of home to foreign firms (that is, when the foreign industry is more concentrated, the home country's tariff actually benefits it and vice versa). Combining it with the effects of the home tariff on the home welfare, both countries can benefit from a tariff if the foreign industry is more concentrated and the initial equilibrium is globally suboptimal.

An important general implication of these results is that, in markets characterized by already existing trade distortions, eliminating some of the trade policies that are considered harmful to trade and welfare can actually result in sub-optimal outcomes. The models discussed in this paper show that the elimination of tariffs may provoke excessive subsidies and, alternatively, elimination of subsidies may increase tariffication. Under certain conditions, even a unilateral tariff may be mutually welfare enhancing. Applying this logic to the peanut trade patterns within the two Americas suggests that the South American peanut producers stand to benefit from the reductions in the U.S. peanut production supports but, paradoxically, preservation of a tariff may still be mutually welfare enhancing. In the broader context of global peanut trade, multi-lateral tariff reduction increases the low-cost exporters' incentives to subsidize export production.

2.3. Product Differentiation and Monopolistic Competition

We only briefly mention the models that accommodate product differentiation and monopolistic competition. Markusen and Venables (1988) showed that product differentiation with free entry leads to a two-way trade. In their model, tariffs are born entirely by consumers and reduce domestic welfare in the consumer surplus but do not affect profits. Export subsidies by the foreign country benefit the foreign country and harm the home one. Domestic subsidy on the home sales improves the home country's welfare.

Models of monopolistic competition in trade were developed by Krugman (1980) and Helpman and Krugman (1989). In monopolistic competition, when there are a number of varieties and producers of each have some monopoly power, tariffs are optimal and depend on the elasticity of substitution between home and foreign products.

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