DIRECT (AND INDIRECT) EFFECTS OF TRADE PROTECTIONISM

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Abstract

This paper begins to develop a simple framework to model strategic dumping in international trade. Dumping is viewed as a signal of the foreign firm being low cost. As the model becomes richer by including variable trade costs and more strategies, the foreign firm has fewer incentives to engage in dumping behavior. When tacit collusion is possible between firms, the incentive decreases even further. Future research will examine indirect effects of protectionist policies by looking at price data from countries not being sanctioned. The purpose of the paper is to develop a model of anti-dumping policies that incorporates network effects.

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1 Introduction

The year 2015 marks the 20th anniversary of the formation of the World Trade Organization (WTO) and 67 years of the General Agreement on Tariffs and Trade (GATT). Since the passage of the GATT, tariffs and trade costs have fallen dramatically [Jacks et al., 2008]. Today, the WTO continues to reduce barriers to trade even further, going beyond tariffs and considering government policies and property rights concerns. After 67 years of reducing barriers to trade, what has been the net effect on prices? Large-scale trade arrangements, such as the WTO, have multiple effects on prices through liberalization. First, by reducing variable trade costs, agreements like the GATT increase the number of firms that participate in trade, exposing consumers to more varieties of goods. These new varieties may have either above- or below- average quality, which would likely introduce more variance in the prices paid by consumers. At the same time, reducing discriminatory tariffs should bring prices of the same good closer together.

The varying effects of trade liberalization are seen in Figures 1 and 2, which show the average price dispersion across time for US imports from all OECD countries. Figure 1 includes Mexico once it joined the OECD in 1995, whereas Figure 2 excludes Mexico over the entire time period. Clearly, the inclusion of Mexico increased price dispersion of US imports. When Mexico is omitted from the data, the price dispersion for differentiated and reference-priced goods declines around 1994-1995, even though it had been trending upwards previously. This particular period in time was big for US trade: the North American Free Trade Agreement (NAFTA) came into force in 1994. At the same time, the Uruguay Round of the GATT negotiations also concluded. Teasing out the different effects of trade liberalization and international trade policies on actual prices will help determine the true impact of large-scale agreements.

Under the WTO framework, anti-dumping actions, including anti-dumping tariffs, countervailing duties, safeguard measures, and quantity restrictions, can be taken against countries when there is material injury to a domestic industry. In the past, offending countries have preferred to use voluntary export restraints (VERs), a form of collusion where they voluntarily imposed quantity limits and charged higher prices. The most prominent example of this is in the automobile industry. In 1981, Japan enacted a VER on their exports to the US. As a result of the quantity restrictions, both Japanese and American automobile firms raised prices. According to Berry et al. [1999], American firms saw an increase in profits while Japanese firms saw a slight decrease in profits, which was still preferred to the loss in profits from imposing a tariff. VERs have since been banned by the WTO, and safeguard measures have been promoted in their place. Safeguard measures are similar to anti-dumping tariffs and quotas, but are intended as a temporary action to allow the
domestic industry time to adjust to new lower-priced competition. Also, while anti-dumping tariffs can be applied to specific countries, safeguard measures must be globally applied. However, when China joined the WTO, the rules surrounding safeguard measures were relaxed to the point where safeguards can be applied only to China, as opposed to all countries, making it significantly easier for WTO member countries to use safeguards targeting Chinese imports. The relaxation of these rules expires in 2014, which will dramatically impact importing industries that find it tougher to insulate themselves from low-priced Chinese competition.

This paper formulates a model of international trade where barriers to trade, such as tariffs and quantity restrictions, can induce strategic collusive behavior in industries. Not surprisingly, increasing the variable trade costs through transportation costs and tariffs, leads foreign firms to prefer collusion rather than aggressive dumping behavior.

In future work, I would like to analyze additional direct and indirect effects of collusion and anti-dumping sanctions on the prices of US imports. Direct effects come from products imported in the US from countries not involved in a policy. As in Figure 2 the average price dispersion of goods imported from developed countries (not including Mexico) declined significantly after Mexico joined the free trade agreement with Canada and the US. This result suggests that, while there may have been a decrease in prices of goods from Mexico, the increased level of competition also concentrated prices from all other US trade partners. I consider this concentration, along with lower prices of Mexican goods, to be the direct effects of the free trade agreement. Indirect effects include the impacts policies have on non-participating countries. Considering the VER in the automobile industry, while Japanese automobile firms experienced a slight decrease in profits from the US, they experienced an overall increase in profits from diverting the cars over the US quota to other countries. This trade diversion meant that prices in markets of countries that were not involved were affected by the US-Japan agreement [Hizon, 1995]. It is likely that, if these effects (both direct and indirect) are detectable, collusion and anti-dumping sanctions have different impacts on different types of goods: collusion may be more likely to occur in an industry with monopolistic competition (ie, in the presence of differentiated goods) where it may be tougher to prove injury to the domestic industry [Messerlin, 2004], while tariffs may be more appropriate in the case of homogeneous goods. Previous trade literature tends to only focus on one or two years worth of data. Using the Census Bureau’s trade data, I can examine 24 years worth of US imports for both differentiated and homogeneous goods, as classified by Rauch [1999], to capture changing effects over time. Placing the model in a network setting, I can consider the effects and externalities associated with: i) changing trade barriers between the US and other countries (specifically, with China), and ii) changing trade barriers between another country and China to see if there are trade-diversion effects, where China’s exports to the US are affected by trade policies that the US is not involved with. By studying this model, I can develop a more complete model of the impacts of trade policies on the network of global
trade. This paper only begins to provide a framework for modeling these effects.

The next section provides background information on dumping trade policies. Then, the following section develops a model of dumping, first as a simple signaling game, then as a more developed model with more strategies available to firms.

2 Anti-dumping

While the GATT is intended to reduce tariffs, the authors did not want to open the door for dumping. The original 1947 GATT Article VI condemns dumping, defined as occurring if “the products of one country are introduced into the commerce of another country at less than the normal value of the products”, when there is the threat of “material injury to an established industry” in the importing country. Therefore, three caveats are included in the GATT: anti-dumping tariffs, countervailing duties, and safeguard measures. Anti-dumping tariffs and countervailing duties (duties used to offset subsidies provided in exporting country) increase trade costs to reflect fair prices. Before either action can be taken, a country must first calculate the damage caused by predatory pricing and prove material injury. An alternative policy is the usage of safeguard measures, which can be enacted in “emergency” situations, so there is a different procedure for approval.

2.1 Anti-dumping and Countervailing Duties

The biggest users of anti-dumping policies are developed countries (Australia, Canada, the EU, the United States, Japan, and South Korea), although the incidence of the policies is increasing in developing countries (Argentina, Brazil, China, India, and Turkey). The majority of anti-dumping actions are taken against developing countries (the most common targets are China, India, and Thailand). Overall, developed countries have been reducing their usage of anti-dumping actions, although most of the reductions have been applied to their imports from other developed countries, and increases in actions taken against China. Developing countries have increased the use of actions against all countries, with the greatest increase coming from China-specific actions. For now, it is generally much easier for countries to enact actions against China. However, once the relaxation of rules for Chinese exports expires after 2014, there is likely to be a shift in the percentage of actions brought against China.

Egger and Nelson [2011] identify four channels through which anti-dumping affects trade volumes: (i) direct protection; (ii) contingent protection; (iii) discrimination; and (iv) firm-specific harassment. The first channel is obvious- an anti-dumping tariff increases the cost of trade and prices of goods, thus reducing the volume of trade. Protection also alters the incentives for production, leading to inefficiencies in the market.
In addition to the effects from inefficiencies, direct protection allows for retaliatory actions, further reducing trade volumes. On top of the directly observable effects from actions, there are also impacts from contingent protection. These effects relate to uncertainty: an exporter does not know, initially, if the prices they set will lead to an anti-dumping duty. The exporter may either choose to set a higher price to avoid an anti-dumping investigation or take their chances with a lower price and a possibility of anti-dumping tariffs. The third channel through which anti-dumping affects trade volumes is due to discrimination. Naming countries in anti-dumping investigations reduces imports from those named, and simultaneously increases imports from non-named countries [Prusa, 2001]. The fourth and final channel identified by Egger and Nelson [2011] is firm-specific harassment, where the domestic industry can pay some cost associated with anti-dumping actions to increase the importing cost of competing firms. These costs include, but are not limited to, higher tariffs and administrative costs for the anti-dumping investigation.

In support of these channels, Beseděš and Prusa [2013] find that anti-dumping actions increase the possibility that firms cease trade by more than 50%. Specifically, most of the impact from actions come during the initial investigation phase, when a preliminary duty is set. Since the preliminary duty is correlated with the final duty, if the preliminary duty is high, many firms exit the market immediately, and the final duty has little impact. Conversely, if the initial duty is low, the effect is more persistent as firms trickle slowly out of the market.

2.2 Safeguard Measures and Beyond

Even though the definition of dumping can be applied strictly, the GATT offers, what is essentially, an escape clause- Article XIX. Article XIX allows emergency actions to be taken by an importing country if there are unforeseen developments, or if goods are imported in higher quantities than before, “threatening serious damage to domestic producers.” In this case, the importing country is free to use quantity restrictions or tariff increases to temporarily relieve the domestic industry. As Hizon [1995] points out, emergency actions, more commonly known here as safeguard measures, essentially give the domestic industry more time to react to new international competitors that have a comparative advantage.

Safeguard measures allow for a “legal” avenue for countries to deal with predatory pricing. However, in some instances in the past, firms and countries have chosen alternative “gray-area measures” to confront dumping activities, due to the difficulty in establishing the necessary “unforeseen developments” and proving the increased quantities of imports. These gray-area measures include voluntary export restraints (VERs). VERs are considered informal agreements that are generally preferred by firms to safeguard measures. They entail quantity restrictions, voluntarily imposed by the exporting country, allowing exporting firms to charge
higher prices, i.e., a quota rent, while at the same time, avoiding legal requirements and administrative costs that come with other solutions [Sykes, 2003]. Thus, the VERs provided a method of forming trade policy outside of the GATT framework. Prusa [2001] points out that the industries most likely to accept VERs are those where domestic producers are more concerned with reducing import competition than promoting fair prices. Because of the informality of the gray-area measures, countries tended to prefer using them instead of the alternative safeguard measures [Hizon, 1995].

However, during the 1994 revision of the GATT, gray-area measures were banned by the Safeguards Agreement, probably in an effort to bring trade relations back under the GATT framework [Sykes, 2003]. Another possible reason VERs were eliminated could be because of their collusive, anticompetitive nature [Hizon, 1995]. For example, when Japan enacted a VER with the U.S. automobile industry, Japan exported fewer cars to the U.S. The quantity restriction increased prices in the U.S., as well as encouraged other countries to enact VERs, further increasing prices. The limited quantities of exports may have led Japanese automobile makers to produce vehicles of higher quality so they could earn a higher profit margin. Therefore, Japanese car-makers began to specialize in a higher-priced segment of the market in the U.S. By earning higher profits in the U.S., Japanese car-makers were free to charge lower, more competitive prices in other markets, leading to more VER agreements with other countries and continuing the cycle. Collusion in this sense led to higher prices for U.S. car consumers, potentially reducing domestic welfare [Hizon, 1995]. In addition to banning VERs, the Safeguards Agreement also strove to clarify the implementation of Article XIX on the usage of safeguard measures, since its ambiguity was a factor in the emergence of gray-area measures.

In 2001, six years after the WTO’s inception, China joined the organization following 15 years of accession negotiations. However, despite the non-discrimination policies the WTO promotes, China’s accession came with a list of exceptions to the rules. In particular, a transitional product-specific safeguard mechanism was included, which effectively made it easier for other member countries to use safeguard measures against China until 2014 [Messerlin, 2004]. Normally, when a safeguard measure is implemented, it affects all countries that export a specific product to a destination. With the China-specific safeguards, one of these measures is only used against China. Instead of proving the domestic industry has experienced “serious” injury, as in the case of every other exporting country, the transitional product-specific safeguard only requires the domestic industry to prove “material” injury, a less restrictive requirement. More importantly, the transitional product-specific safeguard included a trade-diversion clause. Now, once one importing country uses the measure against China, all other WTO countries can impose the same safeguard measure at no additional cost, a process called “echoing.” Without the trade-diversion clause, if one country implemented a measure against China, other member countries would have to pay procedural costs to prove that Chinese
exports are diverted from the first restricted market [Messerlin, 2004]. These networks of safeguard measure- implementations will be important when looking at the effects of policies because there will be network externalities from China-specific measures.

3 The Model

The motivation behind dumping is not clear. An early explanation was that foreign firms would use dumping in order to drive incumbents out of the market and secure a larger market share in the future. However, this relies on domestic firms having a fixed cost of entry that would prevent them from entering the market in the future when they see potential profits. Another explanation for dumping is simply price discrimination: foreign firms can charge a higher price in their own markets, but must charge a lower price abroad.

I first consider a simple model with a single good and a domestic firm and a foreign firm, where dumping serves as a signal to the domestic firm that the foreign firm has low costs. This will only be effective when the foreign firm either does not produce in its home market or charges a high price there. Otherwise, if the foreign firm charged a low price in its home market, domestic firms would not be able to provide evidence against dumping. I will assume that the foreign firm does not produce in its own market to abstract away from modeling the foreign firm’s choices at home. Next, I build on the basic model to include trade costs and the possibility that foreign and domestic firms cooperate, similar to a VER. Finally, I include the possibility of punishment when the domestic firm suspects dumping. In general, the model demonstrates that as the foreign firm’s variable trade costs increase, dumping becomes less appealing. When cooperation between firms is allowed, the cost of dumping increases and it again becomes less appealing.

3.1 Dumping as a Signaling Game

First, consider dumping as a signaling game between a domestic and foreign firm. The model is a two stage model with incomplete information. The domestic firm does not know the marginal cost of the foreign firm, but it knows the probability distribution of costs. The foreign firm wants to send a signal in the first stage, indicating that it has a low marginal cost. If the domestic firm believes the foreign firm has sufficiently low costs, the domestic firm will exit the market because it will not be profitable in the second stage, giving the foreign firm monopoly power. If the domestic firm does not exit the market, both firms must share the market. Firms simultaneously choose quantities, which will determine the market price. Price serves as the signal from the foreign firm to the domestic firm. Denote the domestic firm $D$ and the foreign firm $F$. The following assumption lays out the details of the firms’ marginal costs.
Assumption 1. 

(i) Firms have heterogeneous marginal costs, $\theta_D$ and $\theta_F \in \{\theta^H_F, \theta^L_F\}$.

(ii) $\Pr(\theta_F = \theta^L_F) = x, \ Pr(\theta_F = \theta^H_F) = 1 - x$

(iii) $\theta^H_F > \theta^L_F$

Consider first a pooling equilibrium where both cost types produce the same quantity. A perfect Bayesian equilibrium will be characterized by the belief that the foreign firm always produces as if it has the expected marginal cost, $\theta_F = \theta^E_F = x\theta^L_F + (1 - x)\theta^H_F$, regardless of the actual cost type. As long as the domestic firm has positive profits after paying fixed costs, it will continue to produce in the second stage. If the foreign firm deviates, the domestic firm believes it has a high marginal cost and will not exit the market. Additionally, in the second stage, the domestic firm will choose its quantity assuming the foreign firm is the high type. For now, assume there are no transportation costs for the foreign firm. Let price be a linear function of the quantities sold.

$$P = a - Q_D - Q_F, \ a \geq 0 \quad (1)$$

The domestic firm chooses quantities in a Cournot setting with incomplete information to maximize expected profits. The domestic firm faces some fixed cost, $f_D$. If the firm cannot cover its fixed costs, it will exit the market.

$$\max_{Q_D} \Pi_D = \max_{Q_D} x[P(Q_D + Q^F_F)Q_D] + (1 - x)[P(Q_D + Q^H_F)Q_D] - \theta_D Q_D - f_D$$

s.t. $Q_D \geq 0$

Substituting in for price, the first order condition is as follows.

$$\partial Q_D : -x * Q_D + x(a - Q_D - Q^L_F) - (1 - x) * Q_D + (1 - x)(a - Q_D - Q^H_F) - \theta_D \leq 0, Q_D \geq 0 \quad (2)$$

The foreign firm knows its marginal cost, but it will behave as though it has the expected marginal cost. It solves the following problem.

$$\max_{Q_F} \Pi_F = \max_{Q_F} P(Q_D + Q_F)Q_F - \theta^E_F Q_F - f_F$$

s.t. $Q_F \geq 0$

Substituting in for price, the first order condition is as follows.

$$\partial Q_F : -Q_F + a - Q_D - Q_F - \theta^E_F \leq 0, Q_F \geq 0 \quad (3)$$
Solving equations (2) and (3) for $Q_D$ and $Q_F$, respectively, then finding the intersection, we get equilibrium quantities, $Q_D^*$ and $Q_F^*$, which are used to determine equilibrium profits, $\Pi_D^*$ and $\Pi_F^*$.

\[
Q_D^* = \frac{a - 2\theta_D + \theta_F}{3} \\
Q_F^* = \frac{a + \theta_D - 2\theta_F}{3} \\
\Pi_D = (Q_D)^2 - f_D \\
\Pi_F^* = Q_F^*\left(\frac{a + \theta_D + \theta_F}{3} - \theta_F\right) - f_F \text{ where } \theta_F \in \{\theta_F^L, \theta_F^H\}
\]

Profits are decreasing in marginal cost, so a low-cost foreign firm earns larger profits than a high-cost foreign firm. As long as $\Pi_D^* > 0$, the domestic firm will remain in the market and will produce in the second stage.

The foreign firm will deviate if its payoff from doing so is greater than the payoff from acting as though it has the expected marginal cost. The most likely deviation will be for the foreign firm to produce a quantity, $Q_F^{Dev}$, such that the domestic firm earns nonpositive profits. If the foreign firm chooses any other deviation where the domestic firm has positive profits, the domestic firm will not exit the market and will increase the quantity it produces in the second stage because, according to beliefs, the domestic firm views a deviation as a sign of high costs faced by the foreign firm.

\[
\Pi_D = Q_D^*(P(Q_D^* + Q_F^{Dev}) - \theta_F) - f_D \leq 0
\]

The foreign firm will choose the quantity that makes equation (8) hold with equality. The foreign firm’s first stage quantity and profits in this case are as follows.

\[
Q_F^{Dev} = \frac{(a + 2\theta_D + \theta_F^F)(2a - \theta_D - \theta_F^F) - 9f_D}{3(a - 2\theta_D + \theta_F^F)} \\
\Pi_F^{Dev} = Q_F^{Dev}(P(Q_D^* + Q_F^{Dev}) - \theta_F) - f_F
\]

Since the foreign firm’s profits are decreasing in the quantity it produces for low enough prices, $(\partial \Pi_F/\partial Q_F = -Q_F + P(Q_D + Q_F) - \theta_F)$, first stage profits will be lower when the foreign firm deviates. However, the benefits from deviations come in the second stage, when the foreign firm has monopoly power because the domestic firm exits the market.

\[
Q_F^M = \frac{a - \theta_F}{2} \\
\Pi_F^M = (Q_F^M)^2 - f_F
\]
With no discounting, the total payoff from deviation includes the lower first stage profits and the higher second stage profits. As long as these are less than the payoff from not deviating, then the foreign firm will follow its prescribed strategy. Equation (13) states the condition under which there will be no deviation.

\[ 2\Pi_F^* \geq \Pi_F^{Dev} + \Pi_F^M \]  

\[ 2[Q_F^*(\frac{a + \theta_D + \theta_F^E}{3} - \theta_F) - f_F] \geq Q_F^{Dev}(P(Q_D^* + Q_F^{Dev}) - \theta_F) - f_F + (Q_F^M)^2 - f_F \]  

\[ \frac{1}{4}\theta_F^2 + \theta_F(Q_F^{Dev} - 2Q_F - \frac{1}{2}a) + 2Q_F(\frac{a + \theta_D + \theta_F^E}{3} - Q_F^{Dev}(a - Q_D^* - Q_F^{Dev}) + \frac{1}{4}a^2 \geq 0 \]  

Under certain conditions on the parameters that come from equation (15), \( \theta_F^H \) and \( \theta_F^L \) can be set so that either one type deviates and the other does not, both types deviate, or neither type deviates.

### 3.2 Possible Cooperation

Building on the basic model, the foreign firm faces iceberg transportation costs, \( 0 < \tau < 1 \). Now, in order to sell one unit of good in the overseas market, the foreign firm must produce \( (1 + \tau) \) units. I will also introduce more strategies for the firms. The firms choose to act noncooperatively or cooperatively. By acting cooperatively, the firms act together as a monopolist and restrict quantities produced, leading to greater profits for both. This essentially acts to raise the opportunity cost of a deviation by the foreign firm. Further, the foreign firm may act noncooperatively in multiple ways: it can either be noncooperative in the sense that it still chooses a Nash best response quantity à la Cournot competition, or it can act noncooperatively in the sense of dumping so as to gain larger market shares in the future by eliminating competition. The profits to both firms given the different strategies are explored in this subsection.

In the noncooperative Cournot setting with no restrictions on off-equilibrium behavior and without requiring pooling, the equilibrium quantities will become the following, with price now determined based on the amount of domestic goods produced and foreign goods that arrive in the market.

\[ P(Q_D + (1 - \tau)Q_F) = a - (Q_D + (1 - \tau)Q_F) \]

\[ \max_{Q_D} \Pi_D = x[P(Q_D + (1 - \tau)Q_F)Q_D] + (1 - x)[P(Q_D + (1 - \tau)Q_F^L)Q_D] - \theta_D Q_D - f_D \]

s.t. \( Q_D \geq 0 \)
FOC:

$$\partial Q_D : -x \times Q_D + x(a - Q_D - (1 - \tau)Q_F^L) - (1 - x) \times Q_D + (1 - x)(a - Q_D - (1 - \tau)Q_F^H) - \theta_D \leq 0, Q_D \geq 0$$

$$\max_{Q_F} \Pi_F = P(Q_D + (1 - \tau)Q_F)Q_F(1 - \tau) - \theta_F Q_F - f_F$$

s.t. $Q_F \geq 0$

FOC:

$$\partial Q_F : -Q_F(1 - \tau) + (a - Q_D - (1 - \tau)Q_F)(1 - \tau) - \theta_F \leq 0, Q_F \geq 0$$

$$-Q_D + a - (Q_D + (1 - \tau)Q_F^E) - \theta_D = 0 \implies Q_D = \frac{a - (1 - \tau)Q_F^E - \theta_D}{2}$$

$$-(1 - \tau)^2Q_F + (a - (Q_D + (1 - \tau)Q_F))(1 - \tau) - \theta_F = 0 \implies Q_F = \frac{(a - Q_D)(1 - \tau) - \theta_F}{2(1 - \tau)^2}$$

$$Q_D = \frac{(a - 2\theta_D)(1 - \tau) + \theta_F^E}{3(1 - \tau)}$$

Therefore,

$$Q_F = \frac{(a + \theta_D)(1 - \tau) - \frac{1}{2}(\theta_F^E + 3\theta_F)}{3(1 - \tau)^2}$$

Given quantities, compute price:

$$P(Q_D + (1 - \tau)Q_F) = a - (Q_D + (1 - \tau)Q_F) = \frac{(a + \theta_D)(1 - \tau) + \frac{1}{2}(3\theta_F - \theta_F^E)}{3(1 - \tau)}$$

The price and quantities correspond to the Cournot competition in the previous subsection, except now the foreign firm faces higher variable costs from $\tau$ and the foreign firm is not expected to produce as if it has the average marginal cost.

Alternatively, if the foreign firm chooses to act noncooperatively and wants to undercut the domestic firm, it must produce a high enough quantity that leads to a low price, as before. The ultimate goal is still to drive the domestic firm out of the market so that the foreign firm may be a monopolist in the next stage. However, with the additional transportation costs, the foreign firm will have to produce more in order to
drive the price high enough that the domestic firm wants to exit the market.

\[ \Pi_D = Q_D^* (P(Q_D + (1 - \tau)Q_F^{Dev}) - \theta_D) - f_D = 0 \]  \hspace{1cm} (16)

\[ Q_F^{Dev} = \frac{((a - 2\theta_D)(1 - \tau) + \theta_F^F)(2 \alpha - \theta_D - \theta_F^F) - 9(1 - \tau)f_D}{3(1 - \tau)((a - 2\theta_D)(1 - \tau) + \theta_F^F)} \]  \hspace{1cm} (17)

If the foreign firm is successful in securing the entire market in the second stage, it solves the monopolist’s problem.

\[ \max_{Q_F} \Pi_F^M = P((1 - \tau)Q_F)(1 - \tau)Q_F - \theta_F^F Q_F - f_F \]

s. t. \( Q_F \geq 0 \)

FOC:

\[ \frac{\partial Q_F}{\partial (1 - \tau)Q_F} = (a - (1 - \tau)Q_F)(1 - \tau) - \theta_F = 0 \]

\[ Q_F = \frac{a(1 - \tau) - \theta_F}{2(1 - \tau)^2} \]

\[ P((1 - \tau)Q_F) = a - (1 - \tau)Q_F = \frac{a(1 - \tau) + \theta_F}{2(1 - \tau)} \]

\[ \Pi_F^M = \left[ \frac{a(1 - \tau) - \theta_F}{2(1 - \tau)} \right]^2 - f_F \]

If the foreign firm offers collusion, then quantities are chosen to maximize joint profits, where the firms first set a target profit for one firm, then choose market shares to reach that target profit and quantities to maximize the other firm’s profit. Ideally, the firm with the higher marginal cost is the one that has a target profit set, and the firm with the lower marginal cost maximizes profits while ensuring the other firm reaches its target profit. In this scenario, the domestic firm does not know the foreign firm’s marginal cost so it does not know who has lower marginal cost. Suppose that, while not necessarily the most efficient method, the domestic firm offers a target, guaranteed profit to the foreign firm. The target must be between no profits and the profits the foreign firm would make as a monopolist, \( \Pi_F \in [0, \Pi_F^M] \). Then, the domestic firm solves the following problem, where \( Q \) is the joint quantity produced, and \( S_D \) and \( S_F \) represent respective market
shares.

\[
\max_{Q,S_D,S_F} \Pi^T_{DF} = S_D Q P(Q) - \theta_D QS_D - f_D \\
\text{s.t. } S_F Q P(Q) - \theta_F (1 + \tau) QS_F \geq \Pi_F \\
S_D + S_F = 1 \\
\Rightarrow \max_{Q,S_F} (1 - S_F) Q P(Q) - \theta_D Q (1 - S_F) - f_D \\
\text{s.t. } S_F Q P(Q) - (1 + \tau) \theta_F QS_F \geq \Pi_F, S_F \geq 0
\]

FOC:

\[
\partial Q : (1 - S_F)(a - Q) - (1 - S_F) Q - \theta_D (1 - S_F) - \lambda(S_F(a - Q) - S_F Q - \theta_F S_F (1 + \tau)) = 0 \\
\partial S_F : - Q(a - Q) + \theta_D Q - \lambda(Q(a - Q) - (1 + \tau) \theta_F Q) \leq 0, S_F \geq 0 \\
\partial \lambda : S_F Q P(Q) - (1 + \tau) \theta_F S_F Q - \Pi_F \geq 0, \lambda \leq 0 \\
\Rightarrow \lambda = -\frac{(a - Q - \theta_D)}{a - Q - (1 + \tau) \theta_F} \\
S_F = \frac{\Pi_F}{Q(a - Q - (1 + \tau) \theta_F)} \\
S_D = 1 - S_F = \frac{Q(a - Q - (1 + \tau) \theta_F) - \Pi_F}{Q(a - Q - (1 + \tau) \theta_F)} \\
Q \text{ solves} \\
- 4Q^3 + Q^2 (5a - 4(1 + \tau) \theta_F - \theta_D) + Q(-2(a - \theta_D)(a - (1 + \tau) \theta_F)) + \\
((a - \theta_D)(a - (1 + \tau) \theta_F)^2 + \Pi_F(\theta_D - (1 + \tau) \theta_F)) = 0
\]

By cooperating, the firms earn more profits than if they acted noncooperatively in the first stage. The foreign firm’s incentive to deviate and undercut the domestic firm will now be greatly reduced for two reasons. First, the foreign firm will have to produce even more than before to undercut the domestic firm. Since the domestic firm is reducing the quantity it produces under collusion, the foreign firm must produce more to drive the price down. Therefore, the foreign firm has even lower profits in the first stage, while the monopoly profits stay the same in the second stage. Second, the foreign firm has the opportunity to earn more profits in the second stage under collusion, raising the opportunity cost of deviating. As the target profit for the foreign firm increases, the incentive to deviate declines even more.

While this direct collusion seems like a convenient way to deter dumping, collusion is illegal. VERs were one available option for cooperating, but they are now explicitly banned by the GATT.
3.3 Anti-dumping Actions

If a foreign firm is suspected of dumping, the domestic firm may initiate anti-dumping actions and convince the domestic government of the material injury caused by the dumping. When convinced of injury, the domestic government levies an anti-dumping tariff on the foreign firm’s goods. The tariff is typically a function of the magnitude of suspected dumping. However, in reality, the magnitude of dumping is difficult to determine, and in some cases, controversial even. For now, suppose there is just a flat tariff rate used for dumping, \(0 < \omega < 1\). If the domestic firm succeeds in levying an antidumping tariff on the foreign firm, the latter’s variable costs increase even further.

\[
Q_F = \frac{(a + \theta_D) (1 - \tau) (1 - \omega) - \frac{1}{2} (\theta_F^E + 3 \theta_F)}{3 (1 - \tau)^2 (1 - \omega)^2}
\]

As the variable costs of the foreign firm increase, it becomes easier and easier to maintain an equilibrium such as the one described in the previous section. Deviating becomes harder for the foreign firm and the payoff becomes less attractive. At the same time, collusion, while legal, becomes more desirable.

3.4 Number of Firms

In Cournot competition models, as the number of firms increases, the profits each firm receives fall. As the number of firms approaches infinity, profits fall to zero. This suggests that by extending the model to include more than one domestic firm and more than one foreign firm, the profits for all firms decrease, making having market power more attractive. At the same time, with more firms, cooperation is harder and more costly to coordinate, making it a less viable option, reducing the opportunity cost of dumping. Therefore, it is possible that with more firms, we see more instances of dumping.

4 Conclusion

When firms in an exporting country are suspected of engaging in dumping activities, importing countries have certain actions available to them under domestic policies and GATT. Specifically, the importing country can use legal action against the foreign firms (anti-dumping tariffs). In the past, the importing country could alternatively use “extra legal” measures such as Voluntary Export Restraints, VERs, to come to an agreement with the foreign country whereby the foreign country would restrict its exports, driving up the domestic price and profits. VERs have been banned in revisions of GATT. However, did restricting anti-dumping actions to tariffs improve efficiency, increase the incentive to deviate, or does the possibility of tariffs facilitate tacit
collusion by firms? Is there an alternative mechanism that could reduce dumping and improve efficiency more than the legal process? This paper begins developing a sequential game where a foreign firm has the option to set low prices, and the domestic firm has a few options available if they think the foreign firm’s pricing is unfair, including legal and extra legal measures. It starts to explore if/how tariffs act as a collusion device in an effort to see how efficiency in handling dumping can be improved.
Figure 1: Average Price Dispersion: OECD Countries, Including Mexico after 1995
Figure 2: Average Price Dispersion: OECD Countries, Excluding Mexico
References


