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Abstract

Strategic trade theory shows that government intervention in markets with small numbers of traders can boost the welfare of a country relative to free trade. This survey critically assesses the empirical evidence regarding this possibility. One finding is that while many international food and agricultural markets are characterized by oligopoly, price-cost markups tend to be small, and the potential gains from intervention are modest at best. In turn, existing government interventions such as agricultural export subsidies are generally not optimal in a strategic trade sense. The evidence suggests that oligopoly by itself is not a sufficient rationale for deviating from free trade in international markets.

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Evidence on Imperfect Competition and Strategic Trade Policy

International markets for food, raw agricultural products, and agricultural inputs are often characterized by oligopoly. Trade is commonly controlled by a small number of private firms or state-trading enterprises. Economic theory tells us that such markets have excess economic profits or rents to be captured by the traders involved. A branch of the economics literature known as "strategic trade theory" shows that in certain circumstances a government can take actions to increase a country's share of these rents. This possibility has generated much interest and controversy as it seems to explain certain features of real world markets, on the one hand, but seems to call into question economists' general support of free trade, on the other.

The key study to demonstrate the concept of strategic trade policy is a 1985 article by Brander and Spencer. The approach envisions two exporting countries selling to a third country that does not produce the product. If the government of one of the exporters makes an aggressive commitment to subsidize sales abroad, and the foreign government does not retaliate, the foreign competitor has to reduce its output and the home firm obtains a larger share of sales and profits. In effect, the export subsidies are "rent-shifting" policies: they shift oligopoly profits from the foreign firm to the domestic firm. The intervening country sees a national welfare gain despite its subsidization of the foreign importer.

This finding would appear to justify policies that divert national resources to local firms and institutions that compete in oligopolistic international markets. As a result, a large literature has developed that examines the potential for and existence of strategic trade policy in various markets. This article is a survey of recent developments in the empirical literature, with special attention to international food and agricultural markets.

Our survey takes as a starting point several early syntheses of the strategic trade literature. In a volume edited by Carter, McCalla, and Sharples (1990), Krishna and Thursby review the theoretical literature and stress that optimal strategic trade policy is

sensitive to the details of the market. They highlight the need for empirical research that examines issues of market structure and appropriate policies for imperfectly competitive agricultural markets. Other segments of the literature are reviewed in Helpman and Krugman (1989), Krugman (1989), Corden (1992), Brander (1995), Chang and Katayama (1995), and van Berkum and van Meijl (2000).

A conclusion common to most of these studies is that the theoretical literature cannot supply general policy prescriptions because the results depend closely on the specifics of a market. This is less of a problem with neoclassical trade theory, for example, with its focus on perfectly competitive markets and simplified characterizations of firm behavior. While none of these studies comes out in favor of activist strategic trade policy – and indeed, many warn against such activity – most call for further empirical research regarding competitive behavior and strategic trade policies in international markets.

Our survey synthesizes the recent empirical evidence on these issues and is organized around three general questions. First, what food and agricultural markets have characteristics applicable to strategic trade theory? To answer this we review studies that investigate the extent and form of non-competitive behavior in international markets. Second, of those markets with the necessary characteristics for strategic trade policy, what are the potential gains from government intervention? To address this we assess the results of simulation models that employ econometrics and calibration in confronting strategic trade theories with data. Third, of those markets with the potential for strategic trade policy, is there hard evidence of such interventions? We review studies that address this question for markets with characteristics similar to those of the market considered by Brander and Spencer (1985).

The remainder of the paper is organized as follows. The next section describes the intuition behind strategic trade theory. The following section discusses the controversy surrounding this literature. The following three sections are structured according to the

three questions identified above. We find that strategic trade policy is likely to be operational only for certain markets that conform closely to the specific circumstances investigated by Brander and Spencer. Even then there is little evidence to suggest substantive gains to the firms and nations involved. In short, the literature has yet to make a strong case against free trade on the basis of oligopoly alone.

What is Strategic Trade Theory?

Strategic trade theory is distinct from other rationales for deviating from free trade. One rationale is the "terms of trade" argument, wherein a trade restriction can benefit an individual nation that is large enough to influence world prices. Another rationale is the theory of the second best, which suggests that free trade may not be efficiency-enhancing in the presence of other distortions in the economy.

These rationales have their flaws, and strategic trade theory has its share as well, but the distinctive feature of strategic trade theory is its focus on oligopoly in international markets as the rationale for government intervention. While "strategic trade" can mean different things to different people, this survey focuses on Brander's (1995, p. 1397) characterization, which is that strategic trade applies to settings in which firms have a mutually recognized interdependence. More specifically, the profits of one firm are directly affected by the individual choices of other firms. Thus there will be little focus on other characterizations of strategic trade, such as when government promotes industries that generate technological externalities (e.g., Japanese targeting of semiconductors and European support of aircraft).

The strategic component of the analysis comes through firms trying to convince each other of their aggressiveness. The key ingredient is a credible pre-commitment that supports the domestic firm. The pre-commitment may take the form of subsidies, tariffs, quotas, voluntary export restraints, R&D subsidies, capacity building, or any

other policy instrument that alters the payoffs of rival firms. The pre-commitment is typically modeled as an intervention by government.

In practice the impetus for government intervention is likely to come from a narrowly focused interest group that has a stake in an industry. However, most models characterize the optimal policy as maximizing some measure of national economic welfare. This is possible given the other assumptions that are typically made. For example, domestic consumption of the product is ignored to focus on the competition for excess returns in the international marketplace. In contrast to traditional competitive trade models, gains on the consumption side play no role. Due to the absence of other distortions, the marginal cost of each firm is also the social cost of the resources it uses. As a result, national welfare can be identified with the profits earned by the firm, less the subsidies from the government.

The standard model is set up as a two-stage game. In the initial stage the home government is able to enact an export subsidy for the home firm's output of the homogenous product. In the second stage the firm of each country chooses the quantity to produce and sell to the third country (they are Cournot competitors). Each firm takes the other's output as given when maximizing profit. The domestic government's first-mover advantage is transmitted to the domestic firm such that the latter becomes a Stackelberg leader.

The subsidy lowers the home firm's cost and makes it want to export more for any given export level of the rival. Since the home and foreign products are strategic substitutes (i.e., reaction functions are downward sloping), the foreign firm must reduce its equilibrium output. As the domestic export subsidy increases, aggregate quantity rises, price falls, and the profits of the domestic firm rise while foreign profits decline. In effect, rents are shifted from the foreign firm to the home firm.

Brander and Spencer (1985) is more or less the launching stage for much of the theoretical strategic trade literature. Scores of other rather narrow game-theoretic

models have been analyzed for a variety of topics. A laundry list would include contributions in intermediate inputs in vertical markets (Spencer and Jones, 1991; Ishikawa and Lee, 1997; and Ishikawa and Spencer, 1999), trade in differentiated products (Gruenspecht, 1988), capacity investment (Dixit, 1984), countervailing duties (Dixit 1988a; Qiu, 1995), rent shifting (Fung, Hamilton and Stiegert, 2000), rent shifting under incomplete information (Maggi, 1996; Brainard and Martimort, 1996), transnational technology differences (Neary, 1994), endogenous government control (Goldberg, 1995b, Karp and Perloff, 1995, Maggi, 1996), non-equivalence of tariffs and quotas (McCorriston and Sheldon, 1997; Levinsohn, 1989) and cross ownership of firms (Dick, 1993; Hamilton and Stiegert, 2000).

Objections to Strategic Trade Theory

Almost immediately upon the arrival of Brander and Spencer's study, a number of researchers tried to derive similar results under a wider range of assumptions. They found that the optimal policy changes as one deviates from the three-country, partial-equilibrium, quantity-choosing situation envisioned by Brander and Spencer.

Perhaps the best known and most important such study is Eaton and Grossman (1986), who show that if the firms happen to be price-setters (Bertrand competitors) instead of quantity-setters (Cournot competitors), the optimal policy changes to an export tax. By contrast, if firms' conjectures about each other's behavior are consistent with the actual responses of firms (consistent conjectures), then free trade is optimal. The optimal policy is clearly sensitive to the form of game being played, which itself is difficult to determine for any given market.

Other studies point out additional qualifications and shortcomings. Dixit and Grossman (1986) focus on the fact that Brander and Spencer's partial equilibrium setting ignores the existence of competition among different sectors for scarce resources. A subsidy to the favored sector will cause the marginal costs of other sectors

to rise, which complicates the design of welfare-improving policy. Horstmann and Markusen (1986) focus on Brander and Spencer's assumptions on production technology. In the case of increasing returns to scale, subsidies and tariffs will promote entry by less efficient firms and raise the industry's average cost. In turn, Dixit (1984) shows that the optimal policy is sensitive to the number of firms that are exporting.

Dixit and Kyle (1985) argue that it is important to consider the question of who is behaving strategically with respect to whom. The standard approach allows for strategic interactions between two firms, but potential responses such as government retaliation and changes to market structure are ignored. In effect, government policy is reduced to an exogenous influence on market conduct instead of the product of an intimately linked strategic process (Marvel, 1992).

Another critique centers on the fact that one nation's citizens may own stock in both domestic and foreign firms. Thus the notion of a "domestic" firm is less meaningful in a world of international capital movements. Dick (1993) quantifies the sensitivity of the Brander and Spencer welfare results to assumptions about international ownership of assets. Existing levels of U.S. cross-ownership, for example, reduce the average optimal subsidy by 47% relative to a prediction based on the Brander and Spencer assumptions. So while cross-ownership does not nullify the Brander-Spencer prediction, it will tend to weaken it.

Irwin (1996) argues that concern about international market share is reminiscent of mercantilism. Such a perspective views the volume of world trade as fixed and divided among a few countries. Trade is a zero-sum game and no consideration is given to the consumption side of the issue. Despite Irwin's critique, a major attraction of strategic trade policy is that it can be welfare-enhancing for a country as a whole, and one notes that market share does matter in a meaningful way for actual firms.

Alongside these theoretical qualifications to strategic trade theory, a number of more practical concerns make many observers skeptical of its potential application. For

example, national governments are unlikely to have the analytical capacity to determine the optimal form of trade intervention. To carry out the optimal policy, extensive information on cost, demand, and industrial structure is required. To name just one example, government is unlikely to know whether firm behavior is Cournot, Bertrand, collusive, or one of numerous other possibilities.

Even if government has the analytical capacity to make sound policy-making decisions, the national political process (i.e., lobbying) may compromise the government's ability to enact such policies. A government that demonstrates its willingness to shift rents may soon find itself overwhelmed by interests that seek those rents (Marvel, 1992). Governments that shift rents from other imperfectly competitive exporters in one year may invite retaliation in those or other markets. Over time, the amount of trade surplus over which to fight may shrink faster than a country's share of it can grow.

The Shift to Empirical Analysis

In spite of or perhaps due to the conceptual concerns of strategic trade literature, several strands of empirical work have developed in its wake. One reason is that the theoretical literature offers a robust finding in that international oligopolists *always* have an incentive to unilaterally deviate from free trade (Brander, 1995). Empirical work is necessary to test for such interventions and evaluate their effects. A number of studies reviewed below present evidence regarding this theoretical finding.

Second, despite its flaws, strategic trade theory has great intuitive appeal and appears to offer an explanation for the evolution of certain imperfectly competitive industries. There is much interest in understanding price determination and profitability in such markets. This has also sparked the empirical literature.

Third, a program of empirical research offers a means of overcoming some of the key shortcomings of the theoretical literature (Krugman and Smith, 1994). Empirical

analysis makes it possible to operationalize certain theoretical models that lack a neat closed-form solution. Empirical analysis is also useful for eliminating special cases that are not worth analyzing; for instance it can reveal whether firms are quantity-setters instead of price-setters so as to narrow the range of potential optimal policies. In short, going to the data has proven useful for resolving questions that are ambiguous in a purely theoretical setting.

As outlined in the introduction, the empirical literature that is reviewed here concerns: (a) the existence of imperfect competition in international markets, (b) empirical simulation models of specific industries that have potential for successful strategic trade interventions, and (c) evidence that certain government interventions are actually optimal strategic trade interventions.

Evidence on Imperfect Competition in International Markets

The example of a competitive market that one finds in undergraduate economics textbooks is often an agricultural commodity such as wheat. The view of agricultural markets as perfectly competitive – and thus having no rents to fight over – sometimes carries over from teaching to research. For example, in developing an analytical framework by which to interpret agricultural export subsidies, Bagwell and Staiger (2001) suggest that strategic trade theory offers a foundation by which to interpret them, except that it is applicable only for imperfectly-competitive (namely, Cournot) markets. They view agriculture as perfectly competitive, and as a result develop a competitive market model with political economy features to explain the subsidies.

While perfect competition may be a reasonable approximation for agricultural production, it is much less appropriate at downstream stages. For example, U.S. food processing and distribution is often marked by product differentiation, high concentration, and imperfectly competitive behavior (Sexton, 2000; Connor et al. 1985). International markets are increasingly characterized by these features as well. Trade in

processed, differentiated, high-value food and agricultural products is growing and now accounts for the majority of agricultural export value, including for the U.S.

International trade in undifferentiated primary commodities is also often imperfectly competitive. Consider international corn and soybean export markets, for example. Within the U.S., three firms control 81% and 65% of all exports of corn and soybeans, respectively, and these same firms own the vast majority of U.S. country, sub-terminal, and terminal elevators (Hendrickson and Heffernan, 2002). Since the U.S. has 63% and 53% of the world market for corn and soybeans, respectively, these three firms have significant global reach.

While U.S. commodity marketing is essentially a private sector system, in other countries the government may be a single-desk marketer and engage in day-to-day operations. So-called state-trading enterprises (STEs) are pervasive in international agricultural markets, and many have considerable market power. For example, the Canadian Wheat Board (CWB) and Australian Wheat Board are among the world's major wheat exporters, with each supplying approximately 15% of the world market for this commodity. STEs also operate on the other side of the market as importers of agricultural and food products. Important single-desk buyers of food and agricultural products include the JFA (Japanese Food Agency) and COFCO (the China National Cereals, Oils and Foodstuffs Imports and Export Corporation).

Due to high levels of concentration in international agricultural markets, they have long been modeled as imperfectly competitive. Examples include: McCalla (1966), Sheldon, Pick, and McCorriston (2001), Carter and Schmitz (1979), Sarris and Freebairn (1983), Karp and McCalla (1983), Paarlberg and Abbott (1986), Kolstad and Burris (1986), and Kallio and Abbott (2000).

Of course, the existence of high concentration and nationalized sellers does not imply that mark-ups are high. For example, there may be efficiency benefits such as economies of scale in information handling and risk sharing (Patterson and Abbott,

1994). Yet the point is that oligopoly is often a better characterization of international food and agricultural markets than perfect competition.

Testing Methods

To understand the literature that tests for imperfect competition in international markets, it is useful to first classify the empirical methods that are typically used. Studies that test for the presence and nature of imperfect competition generally take one of three forms. One is the "pricing-to-market" approach, which tracks pricing decisions by exporters across markets as bilateral exchange rates change (Krugman, 1987; Knetter, 1989). If an exporter holds the export price in the domestic currency constant, or lowers (raises) it for an importer who has realized a domestic currency appreciation (depreciation), then price discrimination has occurred. The pricing-to-market approach has the advantage of not requiring data on quantity adjustments associated with the price changes. However, it reveals little about the extent of market power and type of game played by firms. Another drawback is that in general it fails to distinguish price discrimination from other phenomena such as product differentiation.

Another approach to detecting imperfectly competitive behavior are New Empirical Industrial Organization (NEIO) methods. These focus on structural models of supply and demand and on measuring mark-ups over marginal cost. A common NEIO approach is to estimate conjectural variations, wherein the first-order conditions incorporate terms that represent the anticipated responses of rivals (i.e., conjectures). This approach nests various forms of behavior, but has fallen out of favor, largely because it forces dynamic behavior into a static model. Nonetheless, some studies show it to be a reliable indicator of the size of economic rents (Genesove and Mullin, 1998).

Some NEIO studies take a dynamic approach to conjectural variations since this can account for adjustment costs in production or storage and capital accumulation. Other NEIO studies estimate residual demand elasticities since less data are required.

The above approaches can distinguish imperfect competition in a general sense but reveal little about the behavioral game being played. Unfortunately, this is what really matters. Economists rarely know whether Bertrand, Cournot, or some other form of behavior prevails. It is sometimes thought that the Bertrand model is most relevant when marginal costs are flat, while the Cournot model describes situations with steep marginal costs. Yet this is only a crude indication at best.

An approach that addresses this issue relatively directly is the "menu" approach. Here, the nature of the game is imposed upon the structure of the econometric model and tested against alternatives. In particular, one estimates specific models such as Cournot and Bertrand then discriminates among them using non-nested hypothesis tests. This approach is the most useful of those surveyed above when the goal is to empirically evaluate strategic trade theory.

Evidence on Market Structure: Specific Commodities

What are the results of applying the above methods to specific international markets? This section provides a detailed overview of the evidence, organized largely by commodity.

Consider the international rice trade. Karp and Perloff (1989) develop a dynamic NEIO approach to examine the structure of the rice export market. Thailand, Pakistan, and China are modeled as oligopolists, and all other countries are treated as a competitive fringe. The econometric evidence confirms that this market is oligopolistic but suggests that it is closer to competition than collusion. Yumkella, Unnevehr, and Garcia (1994) use a pricing-to-market approach and find evidence of non-competitive behavior among U.S. and Thai exporters of certain varieties of rice.

Karp and Perloff (1993) study whether the two largest coffee exporters – Brazil and Colombia – are price takers, oligopolists, or in collusion. As with their rice study they employ a dynamic, quantity-setting homogeneous-product model. The coffee export

market is found to be oligopolistic, but mark-ups are nonetheless small. Buschena and Perloff (1991) find that the Philippines exercises substantial market power in the coconut oil export market. In a dynamic analysis, Deodhar and Sheldon (1996) find that the German banana import market is best characterized by a Cournot-Nash equilibrium.

Using an NEIO approach, Arnade, Pick, and Gopinath (1998) report that the U.S. meat processing industry is oligopolistic in domestic and foreign markets, but mark-ups are not statistically different than zero. They do find statistically significant mark-ups in the rice milling and cigarette industries.

Using the menu approach, Carter and MacLaren (1997) examine Australian and U.S. beef sales into the Japanese market. Six oligopoly games are considered: Bertrand, Cournot, Stackelberg with U.S. price leadership, Stackelberg with Australian price leadership, Stackelberg with U.S. quantity leadership, and Stackelberg with Australian quantity leadership. A Vuong test indicates that the Stackelberg model with price leadership by Australia best fits the data. In another application of the menu approach, Dong, Marsh, and Stiegert (2006) find statistical evidence that the global malting barley market operates as a quantity-setting oligopoly.

Using a pricing-to-market approach, Pick and Park (1991) find evidence for price discrimination by U.S. wheat exporters among importing countries. Likewise, Patterson and Abbott (1994) find statistical evidence of price discrimination and hence market power by U.S. wheat exporters, although the margins are small. Anania, Bohman, and Carter (1992) report that excess profits are absent from the international wheat market.

Deodhar and Sheldon (1997) examine market power in the world market for soybean meal exports. Although the extent of country participation makes this market oliogopolistic, the authors conclude that mark-ups are at competitive levels. By contrast, Pick and Park (1991) obtain ambiguous results on soybean meal exports when using the pricing-to-market approach. These authors also find ambiguous results on

soybean oil and cake, but reject a hypothesis of price discrimination across destination markets for soybeans, cotton, and corn. On this latter commodity, Patterson and Abbott (1994) find statistical evidence of price discrimination, although the markup is small.

In a residual demand elasticity analysis, Glauben and Loy (2003) find that competitive conduct characterizes German exports of beer, cocoa powder, chocolate, and sugar confectionery. When these authors redo their analysis using a pricing-to-market approach, however, they do find evidence of market power in German exports of beer to North America, in exports of sugar confectionery to the UK, and in exports of cocoa powder to Italy. A possible explanation for the discrepancy is use of a fixed contract, which may be invariant to changes in exchange rates and thus would invalidate the results of the PTM approach.

Surprisingly few studies examine the competitive structure of international markets for non-agricultural products and services. One example is Brander and Zhang (1990, 1993), who estimate Cournot, Bertrand, and cartel models for the airline industry, and find that the data are most consistent with Cournot behavior.

Winters (1994) sheds light on strategic behavior in international markets using an approach quite distinct from those outlined above. He has no formal model but examines a novel dataset containing information on volumes, prices, and origins of European Community imports before and after the imposition of import surveillance. The idea is that reporting the flows of an import (e.g., on a monthly basis) is not about gathering information so much as to make a threat about the potential to enact future restrictions on imports. Winters argues that import surveillance should not matter for a competitive industry. However, the behavior of exporters must be strategic if they alter their exports upon the introduction of import surveillance. For example, overseas producers as a whole face an incentive to exercise voluntary restraint so as to avoid imposition of some type of quantitative restriction. The fewer the exporting firms, the more likely they will reach such an agreement. Winters' data suggests that the

imposition of import surveillance does indeed curtail imports and has detectable and long-lasting protective effects. Surveillance is more likely to reduce imports when exporters believe they can influence the probability of future quotas.

While it is difficult to generalize, the overall message of this wide-ranging literature is that oligopoly and hence strategic behavior exists in many international markets, including agricultural and food markets. This leaves a potential role for strategic trade theory à la Brander and Spencer (1985). However, in most cases the markups differ little from what would occur in a competitive market. Although these studies are not the last word on the topic, few international markets would appear to have rents worth fighting over.

Calibrated Strategic Trade Models

The statistical evidence on imperfect competition suggests that strategic trade policy is unlikely to have substantial benefits. None of the above studies look specifically at strategic trade policy, however, and are not a full-fledged analysis of the issue.

Most efforts to confront strategic trade models with data rely primarily upon calibrated simulation models. Calibrated strategic trade models are sometimes referred to as 'Industrial Policy Exercises Calibrated to Actual Cases' or IPECACs for short (Krugman, 1989). They are the numerical implementation of theory, and in this sense are similar to Computable General Equilibrium (CGE) models. As with CGE models, econometric estimation of the entire system of behavioral equations is usually impossible due to model complexity and limited data. In turn, hypotheses cannot usually be tested statistically. CGE models are different, however, in that they generally employ the simplifying assumption of perfect competition, which eliminates the difficult task of modeling the behavior of oligopolistic firms.

A seminal calibrated strategic trade study is Dixit (1988b), who examines optimal tariff and subsidy policies in the context of the U.S. automobile market. Instead of

maintaining a single characterization of firm behavior he tries to calibrate the model to Bertrand as well as Cournot behavior. However, the data turn out to be inconsistent with either one. Thus instead of imposing one of these pre-determined structures, Dixit employs a conjectural variations approach. Optimal production subsidies and tariff rates are calculated to fall in the low double-digit range. The resulting welfare gains are nonetheless calculated to be quite small. As such, the study yields little support for strategic interventions by the U.S. government in the automotive market.

One shortcoming of Dixit's study is that products are treated as homogeneous, so there is no distinction between small and large cars, for example. With this in mind, Krishna, Hogan, and Swagel (1994) extend Dixit's model to allow for product differentiation and certain other important features of the automobile market. Special consideration is given to how choice of functional form influences the derivation of the optimal tariff. While this enables a richer analysis than Dixit's, the gains from activist policy are again calculated to be quite small.

In an agricultural example, Thursby and Thursby (1990) examine competition between U.S. exporters and the Canadian Wheat Board with respect to wheat sales to Japan. As in Dixit (1988b) the behavioral assumption is Nash equilibrium with conjectural variations that are calibrated to be consistent with market data. A methodological improvement, however, is that demand elasticities are first estimated, which opens up an avenue for a degree of sensitivity analysis. However, there is a critical lack of data in certain critical areas, and the approach consequently incorporates a large number of maintained assumptions that are left unevaluated. Thursby and Thursby's policy experiment involves the removal of Japanese import restrictions and U.S. and Canadian producer subsidy equivalents. One result is that if U.S. firms have Cournot conjectures about other U.S. firms, they are likely to have Bertrand conjectures with respect to the Canadian Wheat Board. The results extend little beyond rudimentary findings such as this, unfortunately, and no welfare effects are calculated.

In a variation on this strand of research, McCorriston and Sheldon (1991) empirically implement a strategic trade model of the UK fertilizer industry. They investigate whether there is any justification for government intervention, such as tariffs, in a market that is characterized by importers who sell at low prices due to production subsidies by their governments. A significant feature of McCorriston and Sheldon's study is an attempt to account for changes in strategic behavior and market structure over time. They demonstrate that optimal policy must be continuously updated, and that failure to do so leads to significant welfare losses. They further find that the net welfare effects of an optimal intervention are in any case small. Ultimately, little justification is found for government intervention.

Many other interesting strategic trade simulation models have emerged in the literature, including a number in a volume edited by Krugman and Smith (1994). Among the industries to receive attention are airlines (Klepper, 1994; Norman and Strandenes, 1994), telecommunications (Kahai, Kasserman, and Mayo, 1996), 16K random access memory (Baldwin and Krugman, 1988), and the international automobile market (Smith, 1994; Feenstra, Gagnon, and Knetter, 1996; Goldberg, 1995a; McCorriston and Sheldon, 1997).

Most of these studies are beset by a number of common limitations that make this branch of the strategic trade literature almost as controversial as the theoretical strand. It is common for them to end with a warning against taking the 'optimal' policy intervention too literally. In a characteristic example, Krishna, Hogan, and Swagel (1994) urge the reader not to misinterpret their results, suggesting that they "should be interpreted with extreme caution ... it remains vital not to oversell such models to policymakers" (p. 36).

One common limitation is that alternative forms of strategic interaction are generally excluded. For example, ideally one would examine how firm and government behavior affects market equilibrium as well as how industry structure affects firm and

government behavior. In turn, political economy issues such as lobbying are usually left unconsidered. Another issue is data aggregation, which may preclude any role to be played by product differentiation. Furthermore, demands are typically assumed to be linear, and demand parameters are generally calibrated instead of estimated. Marginal costs are generally assumed constant, and capital costs are often poorly handled. Finally, most of the studies are built around a reaction curve oligopoly model of some form, which is not a good basis for oligopoly theory.

Amidst these qualifications, the majority of these studies nonetheless yield a common conclusion: the gains from strategic trade policy are small when they are positive at all.

Direct Tests of Strategic Trade Theory

The above-surveyed calibrated studies do not provide evidence on the existence of *actual* strategic trade interventions. Rather, the results are contingent upon numerous maintained assumptions about industry structure and firm behavior. This section considers studies that seek direct evidence of government rent-shifting interventions. The focus is on cases in which a government has made a unilateral pre-commitment to a home firm or government marketing agency.

An interesting non-agricultural example is provided by Clougherty (2002a), who examines U.S. airline concentration. He tests the idea that a government can help build a "national champion" airline that can penetrate international markets on the strength of its extensive domestic network. Allowing for domestic consolidation may subsequently alter international market competition such that national welfare and national industry profitability are improved.

Clougherty argues that standard critiques of strategic trade theory are less relevant to the world airline industry. Airline services are reasonably modeled as strategic substitutes with Cournot competition, as in Brander and Spencer (1985). A strategically

protected airline industry is unlikely to raise the cost structure of other industries, as in Dixit and Grossman (1986). Since domestic consolidation is examined, concerns about entry by small firms operating too low on the returns-to-scale curve are irrelevant, unlike in Horstmann and Markusen (1986). In addition, recent evidence suggests that domestic airline consolidation can involve significant international competitive gains (Clougherty, 2002b).

Clougherty (2002a) uses a panel data set covering 21 country-pair markets over 1983-1992 to regress international market share on home-nation and foreign-nation domestic concentration and other key factors. Although this approach does not involve a formal structural model, he does deal with endogeneity problems through instrumental variables. Concentration at home is found to positively impact the international market share of a national airline industry. In turn, foreign-nation domestic concentration negatively impacts international market share. This might seem to support the idea that an airline can improve its international competitive position by matching extensive domestic networks with international routes, and by completing domestic airline mergers. One notes, however, that Clougherty's results do not falsify other potential rationales as to why the mergers took place, such as domestic market power or efficiency gains.

Certain agricultural markets have proven quite fruitful for investigation of actual strategic trade interventions. Two recent studies, Hamilton and Stiegert (2002) and Dong, Marsh, and Stiegert (2006), argue that state trading enterprises (STEs) – which have become quite common in international agricultural markets – fit the plausibility requirements associated with strategic trade theory in several ways. The former examines the Canadian Wheat Board (CWB) in the international durum market; the latter examines the CWB and Australian Barley Board (ABB) in the malting barley market.

Recall that a market must meet a number of criteria for strategic trade theory to apply. One condition is an imperfectly competitive market characterized by a small number of players. Hamilton and Stiegert (2002) observe that the CWB controls 40-60% of the world durum market and is the only STE in operation. In turn, the CWB and ABB are the two major players in the global malting barley market (Dong, Marsh, and Stiegert, 2006). Time-series studies of international grain prices are broadly consistent with some form of STE leadership in these markets (e.g., Goodwin and Schroeder, 1991).

Another key sign of strategic trade activity is a unilateral pre-commitment by a government. This criterion is met in the durum and malting barley markets as producers in Canada and Australia receive an initial payment substantially below the market price. This can be viewed as a mechanism for attaining a Stackelberg leadership position. The delayed payment system is completed with a lump-sum final payment.

Another consideration is that STEs maintain legal and exclusive control over the instruments of strategic trade and the quantity traded, whereas independent firms might have strategic delegation issues and asymmetric information problems. Markets with STEs are also fairly transparent, which facilitates the sending of signals to rivals, and thus Brander-Spencer-type interventions. As government agencies, the CWB and the ABB are partially insulated from many of the typical political economy issues facing a national government. They also have a great deal of autonomy in setting initial prices, bargaining in export markets, and managing storage/carryover decisions. Indeed, if a government were interested in providing strategic international advantage, using an STE such as the CWB could be, in many ways, the best of all possible structures.

Optimal rent shifting in Hamilton and Stiegert (2002) is empirically modeled with an isoelastic demand equation and estimated conjectural variation parameters. Based on 1971-1995 data on the durum wheat market, actual pre-commitment payments are not statistically different from optimal pre-commitment payments in 77% of the sample

years in which a positive payment is observed. This is consistent with active strategic trade intervention in durum wheat markets.

In contrast, no such evidence arises in the international malting barley market as studied by Dong, Marsh and Stiegert (2006). This market is different in that it has two important STEs (instead of one), and it also has less evidence of product homogeneity. As a result, the authors incorporate product differentiation and pre-commitment by both nations in their test for strategic trade interventions. Based on a bootstrapped estimation of a Bayesian system of reaction functions, the authors find that actual pre-commitment payments are below optimal levels. In essence, the prepayment system does not effectively function to shift rent, and strategic trade policies – if there are any – are not optimal. A likely reason is that if malting barley can be differentiated, the STEs may be focused on building niche markets as a source of market power. Once properly differentiated, premiums can be extracted from the world market irrespective of the prepayment system. The existence of two functioning STEs, both with a below-market prepayment system, may preclude the development of effective strategic trade policy.

Taken together, the above evidence seems to confirm a key conclusion of the theoretical literature, namely that the Brander and Spencer framework does not extend much beyond its homogeneous-product duopoly roots. These studies are perhaps the most direct tests of the Brander and Spencer framework that have emerged. While the world durum market is notable for showing signs of effective strategic trade interventions, the result does not come through in the malting barley market. The former is a very special case of a single STE controlling 50% of a market for a fairly homogenous product. The malting barley market, by contrast, is less concentrated and has more product differentiation. The latter two departures from the Brander and Spencer framework may be enough to invalidate the potential for strategic trade policy.

Government intervention is rife in other agricultural markets, and at times some observers have attempted to interpret this as strategic trade policy. GATT Article XVI

allows for export subsidies for primary products such as agricultural goods, provided the subsidy received does not displace the exports of another member. Key agricultural exporters – most notably the U.S. and European Union – maintain support for farmers, landholders, and agribusiness. Under the U.S. Export Enhancement Program (EEP) exporters receive cash payments that allow them to sell at prices below the cost of acquisition. Other U.S. programs support farmers through loan deficiency payments, counter-cyclical payments, marketing loan gains, crop insurance programs, and direct payments. In the U.S., most of this support goes to five crops: corn, soybeans, cotton, wheat, and rice. By contrast, European Union support is often directed towards the exports of processed products such as wheat flour and pasta.

Such activities are production or trade distorting and are "strategic" in the sense that they are a response to – or invite a response from – other exporter governments. In turn, they may increase a nation's share of world markets. However, these subsidies cannot be interpreted as a manifestation of strategic trade policy. The maximization of national welfare has never been a rationale for EEP. Rather, the subsidies are a means for meeting overall domestic farm program objectives (Anania, Bohman, and Carter, 1992). The EEP reflects the competing interests of farm constituents, Congress, and the executive branch and is consequently ad hoc in its design. In contrast to what one might expect under strategic trade policy, the EEP has been far more sensitive to domestic budget constraints and the volatility of world wheat prices than to foreign subsidy programs (Busch, 1999). Ultimately, agricultural export and production subsidies are at heart a victory of exporter interests over national, importer, and world interests.

Summary and Conclusions

This study reviews empirical evidence on the possibility that strategic trade policies can enable firms to increase their share of rents from oligopolistic international markets.

The theoretical strategic trade literature makes clear that this is a controversial result, as the optimal policy is sensitive to the structure of the market and the parameters of the model. As such, the theoretical literature amounts to a collection of special cases, and a practical guide to strategic policy-making cannot be constructed. In turn, strategic trade policies typically have a beggar-thy-neighbor effect and few studies have given serious consideration to retaliation and the possibility of a trade war.

Despite these concerns, the empirical literature continues to grow and has evolved into three distinct strands that are reviewed in this article. The first involves relatively general tests of market structure and behavior in international food and agricultural markets. These markets are found to often be oligopolistic in nature, with Cournot or Bertrand behavior as the mode of conduct. While this suggests potential for the application of strategic trade policy, this is offset by the fact that price-cost markups are generally small or nonexistent.

The second strand of literature reviewed here concerns strategic trade simulation models whose parameters are calibrated or econometrically estimated. The general consensus of this group of studies is that carefully designed tariffs or subsidies could improve upon free trade in certain markets. However, none of these models suggest that the gains will be large. Indeed, all of these studies caution against interpreting their results as pro-interventionist.

The third strand of the empirical literature examined here considers evidence of strategic trade policy in action. Because world trade agreements for agriculture make allowances for state trading enterprises and certain types of subsidies, this sector has proven to be a fruitful area of investigation. For example, evidence of strategic trade policy is found in the international durum wheat market, which has characteristics that closely mimic the strategic trade setting envisioned by Brander and Spencer. Yet the seemingly similar malting barley market yields no such evidence in spite of a series of robustness checks in both studies. The latter market has relatively pronounced product

differentiation and lower firm concentration, which may be enough to invalidate the possibility of rent-shifting. Perhaps not coincidentally, this is in line with the fragility of results to be found in the theoretical strategic trade literature.

Ultimately, none of the evidence reviewed here suggests that much can be gained from pursuing strategic trade policies. On the other hand, there appears to be much that can be lost, although the possibility of retaliation is an issue that has received limited attention thus far. While imperfect competition is pervasive in international food and agricultural markets, the margins tend to be low, and only one agricultural example is found that can be construed as optimal strategic trade policy. Nonetheless, strategic trade research will remain important because it sheds light on certain aspects of international markets for which neoclassical perfect-competition models have had little to say. It has clarified many aspects of international competition, and provides a rigorous means of assessing the promise and perils of government intervention.

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