INTERNATIONAL TRADE POLICY
WITH IMPERFECT COMPETITION

RICHARD POMFRET

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INTERNATIONAL FINANCE SECTION
EDITORIAL STAFF

CONTENTS

LIST OF FIGURES

TABLE

1 INTRODUCTION

The hottest topic in international trade theory during the 1980s was undoubtedly imperfect competition. The work on monopolistic competition by Paul Krugman (1979, 1980) and Kelvin Lancaster (1979, 1980) and on oligopoly by James Brander and Barbara Spencer (1981) spawned a vast new theoretical literature. Relaxation of the assumption of perfect competition led to the discovery of new circumstances in which trade barriers could increase national welfare, and a case could then be made for governmental interventions under the generic heading of "strategic trade policy."

In the second-best world of imperfect competition,[1] where trade barriers may or may not be welfare-reducing, it is crucial to gain a sense of whether or not the "new" conclusions are likely to hold in typical real-world situations. So far, however, theory has run far ahead of empirical work, and few of the hypotheses have been rigorously tested—not least because of the inherent difficulty in modeling imperfectly competitive markets. Prior conceptions about whether international markets are more or less competitive dominate actual measurement.

Proponents of the new trade theories argue that the prevalence of imperfect competition is self-evident in manufacturing and is also often present in agriculture, where government marketing boards or large trading companies often handle international trade. Helpman (1990b,

[1] "Second-best" is used to indicate non-Pareto optimal situations. The term is unattractive when applied to trade policies in which the absence of perfect competition excludes the "first-best" policy because it implies that policymakers are failing to find a superior policy when in fact the choice is among policies that are not first best. A more neutral terminology is to refer to the optimal policy when the outcome is constrained by technology or by entry barriers. Nevertheless, it would be perverse to avoid the conventional term, and it does remind us that theoretical arguments for welfare-increasing deviations from free-trade policies are certain to arise when the full set of assumptions required for Pareto optimality is not fulfilled.

p. 36) concludes his theoretical survey with the statement that "international trade theory has taken advantage of a new framework that has brought it closer to reality than ever before." Appeals to the real world for support tend to rely on a few recurring examples: semiconductors, civilian jet aircraft, and automobiles.[2] Skeptics believe the traditional trade-theory assumption that the working of international markets is reasonably well approximated by perfect competition, or would be in the absence of barriers to trade and industrial policy. International markets are more competitive than domestic markets. The world car industry, with a Herfindahl index of 0.11 in 1982 (see Dixit, 1986), is less concentrated than national car industries. As to monopoly, it is incontrovertible that monopolies are more common in domestic markets, where they are propped up by government policies, than in international markets, where true monopoly is rare. Even if international markets are more competitive than domestic markets, imperfect competition may still be important, but there is no systematic evidence to show how important.

Previous synthesizing work in this area reflects the dominance of theory. Helpman and Krugman (1985, 1989) aim to provide a unifying theoretical framework for analyzing international trade and trade policy with imperfect competition. Helpman (1990b) focuses on trade theory with monopolistic competition. Vousden (1990) contains a thorough modern textbook analysis of trade policy with various market structures. Corden (1990) and Baldwin (1992) present interpretative essays on the policy significance of the new trade theories. Only Richardson (1989) presents a survey of empirical work, and his is an assessment of eight early studies. None of these writings systematically confronts the many theoretical models with the empirical evidence to assess which models have practical significance. The present paper attempts to fill the gap.[3]

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[2] Support is also adduced from the growth of intra-industry trade, greater product variety, and the increase in intra-firm trade, plus the evidence from the literature on industrial organization that many firms trading internationally operate on the downward-sloping part of their average cost curve. This is either indirect evidence, and hotly debated with respect to intra-industry trade (see Chapter 6), or anecdotal, in the sense that it fails to shed light on how prevalent imperfect competition is in international markets.

[3] Apart from a brief footnote in Chapter 6, this survey does not discuss the economic-growth literature in an open economy characterized by imperfect competition. Although interest in this area has recently expanded, theoretical and empirical work on the subject is still in its infancy (and reasonably distinct from the body of literature covered here).

This survey starts with cases of pure monopoly, the most analytically tractable form of imperfect competition. Domestic monopolies are discussed in Chapter 2. Many of the results pertaining to a single domestic firm have long been part of mainstream trade theory. There is also, of course, considerable literature on the optimal-tariff argument for protection, but it is not discussed here because it involves use of macro-level monopoly power, whereas the new literature's focus is microeconomic. The case of a foreign monopoly, although of little practical relevance in itself, provides a clear illustration of one of the major themes of the new trade theories, that is, that tariffs can be used to transfer rent from foreign firms with monopoly power to the importing country. Foreign monopolies are discussed in Chapter 3.

The case of monopoly illustrates clearly some elements of the arguments for and against interventionist trade policies with regard to imperfectly competitive industries: rent-snatching and infant-industry arguments in favor of intervention, and antitrust arguments in favor of free trade. The same arguments extend to other imperfectly competitive market structures.

The other important new argument for intervention, that it can tilt the strategic game among oligopolists in favor of domestic firms, is rarely welfare-increasing and is more likely to facilitate oligopolistic collusion. These issues are discussed in Chapters 4 and 5. Similarly, monopolistically competitive market structures add a new theoretical case for protection, but the general presumption is that, in such a setting, free trade will normally yield further gains over and above those in a perfectly competitive industry. Monopolistic competition is discussed in Chapter 6.

Chapter 7 reviews the empirical literature, especially the work on hotly debated candidates for strategic trade policy (semiconductors, civilian jet aircraft, and automobiles). This chapter focuses on the rent-snatching, scale-economy, and antitrust aspects of trade policy, rather than on externalities (the incorporation of which into commercial-policy theory is not new). The conclusion is that the existence of scale economies and imperfect competition strengthens the global gains from trade, although it may also enlarge the potential gains from one country's trade barriers. In the existing empirical literature, however, opportunities to increase national welfare by strategic trade policies are unproven.

Chapter 8 briefly recapitulates the conclusions from the theoretical and empirical work, focusing on the implications of imperfect competition for positive and normative trade theory and on the political economy of

trade policy. Consideration of imperfect competition has provided powerful interpretative tools for a positive theory of trade policy when the first-best situation is unattainable, but many results are not robust to realistic extensions. The future path should therefore be to search for better, more realistic, models; empirical studies should be used to test the models and to determine which paths have the best prospects. Meanwhile, it is important to ensure that special-interest groups do not make use of preliminary results to pursue their sectional concerns.

2 DOMESTIC MONOPOLY
(COMPETITIVE WORLD MARKETS)

A standard result of trade theory is that international trade limits the abuse of domestic monopoly power. Consider a monopolist in a small country, with constant or increasing marginal costs, faced by a world price too low for exporting to be profitable. In such a case, a domestic monopoly will charge a higher price than competitive firms will charge, and net national welfare will be lower. A prohibitive tariff permits the exercise of monopoly power, and, with a domestic monopoly, the tariff, which is prohibitive to imports, is higher than with a perfectly competitive industry. A nonprohibitive tariff, like a price ceiling, acts as an effective antitrust policy.

These conclusions are all straightforward extensions of microeconomic theory and have long been accepted as one of the arguments for free trade.[4] The empirical significance of trade liberalization as a means of increasing welfare by reducing monopoly power is often assumed but not conclusively established. Domowitz, Hubbard, and Petersen (1986, 1988) have found a negative relation between import-penetration ratios and price/cost margins in the United States, a relation that supports the hypothesis that international trade limits the abuse of monopoly power. An extensive Canadian literature on the relation between trade policies and technical efficiency also generally confirms that high tariffs are associated with inefficiently short production runs or levels of operations below minimum-efficient scale.[5] Earlier studies of industrialized countries are surveyed in Caves (1980) and Geroski and Jacquemin (1981). In the (*a priori*) more promising field of trade liberalization in developing countries, the procompetition effects of reducing trade barriers have proved difficult to establish—perhaps because so many other factors are

[4] Monopoly is introduced into standard trade models in a general-equilibrium, 2 x 2, setting by Melvin and Warne (1973) and in a partial-equilibrium setting by Fishelson and Hillman (1979). It also features in Corden (1974) and other trade texts. Cassing (1977) shows how monopoly in the nontraded sector can also affect trade patterns.

[5] This literature is surveyed in Markusen (1985). It originates from the work of Eastman and Stykolt (1960, 1967), mentioned below, but Markusen focuses on a series of studies by John Baldwin and Paul Gorecki that finds strong efficiency gains from Canadian trade liberalization during the 1970s without any reduction in the size of the manufacturing sector.

changing simultaneously. Pack (1988, p. 353) observes in his survey that "to date there is no clear confirmation of the hypothesis that countries with an external orientation benefit from greater growth in technical efficiency in the component sectors of manufacturing"; Bhagwati (1988b) reaches a similar conclusion. De Melo and Urata (1986), Tybout, de Melo, and Corbo (1990) on Chile, and Harrison (1990) on Côte d'Ivoire, have marshalled some suggestive microeconomic evidence to support the hypothesis that, during a major trade-liberalization episode, the activities for which the effective rate of protection falls most experience the greatest increase in technical efficiency. The overall assessment, however, is far from conclusive.

It is well established that quantitative restrictions on imports (quotas) restrict monopoly power less than do tariffs. The geometric analysis is in Heuser (1939, pp. 163-167) and is discussed in Meade (1951, pp. 282-285). The existence of domestic monopoly is one of the cases of non-equivalence between quotas and tariffs recognized from the start of this literature (Bhagwati, 1965, 1968; Shibata, 1968).[6]

With the possibility of exporting, a domestic monopolist will make full use of any tariff to set marginal cost equal to marginal revenue in the domestic market and then export at the lower free-on-board (f.o.b.) export price until it equals marginal cost. Such price discrimination was analyzed in Viner's (1923) classic study of dumping (there are additional definitions of "dumping" in current parlance). More recently, Fishelson and Hillman (1979, p. 50) and Bhagwati (1988a) have developed this argument. In Figure 1, which ignores transport costs, the single domestic firm produces OA units, for which marginal costs are equal to the world price. With free trade, domestic consumption is OB, and AB units are imported. With a prohibitive tariff, the domestic firm exploits its monopoly power to increase the domestic price to P_d; domestic consumption falls to OC, and CA units are exported at the world price. If demand and cost curves capture social benefits and costs, the net welfare loss from imposing the tariff is equal to the triangle EFG (that is, the monopoly rent minus the lost consumer surplus). In practice, the

[6] There are other reasons for nonequivalence, and, if the government's objective is the domestic price (rather than output or the level of imports), then the quota can even be shown to be superior (McCulloch, 1973). The nonequivalence in the presence of a domestic monopoly also depends upon the order of moving, that is, it assumes the government is a Stackelberg leader. If the monopolist knows the government's response to any action—if, that is, the firm is the Stackelberg leader—then equivalence is restored (Sweeney, Tower, and Willett, 1977).

welfare effects are more complicated if the country, like many developing ones, has a fixed and misaligned exchange rate.

FIGURE 1

EXPORT-INDUCING PROTECTION WITH A DOMESTIC MONOPOLY
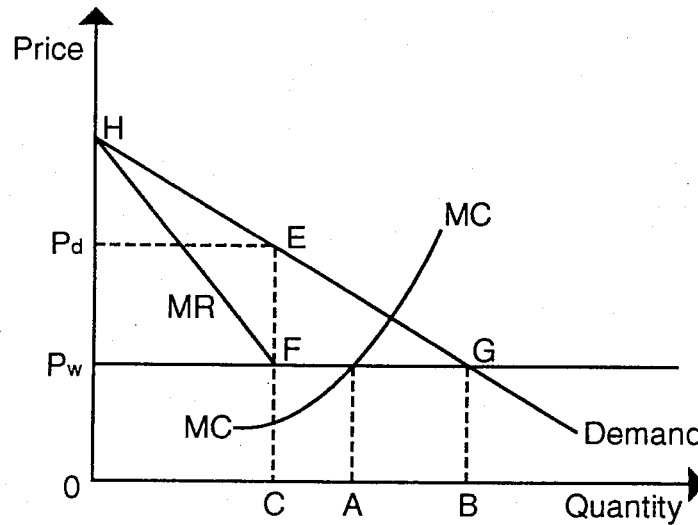
If the marginal cost curve in Figure 1 were above the P_w line, protection from imports might induce domestic production where none would exist under free trade. This is the old infant-industry argument for a tariff. Unless externalities or scale economies are present, such protection must involve a welfare loss to society.[7] Moreover, tariffs are

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[7] Baldwin (1969 [1988]) concludes, on the basis of examining the microfoundations of the dynamic scale economies assumed by proponents of infant-industry protection, that such protection can rarely correct the market distortion. Corden (1974, chap. 9) critically analyzes "learning-curve" arguments for protection of infant-industries, and Grossman and Horn (1988) examine "reputational" arguments; both studies reinforce Baldwin's conclusion. Both Krugman (1987) and Stegemann (1989) list externalities in their surveys, and especially "racing down the learning curve," as one of the two reasons for strategic trade policy (the other is the rent-snatching argument). De Meza and Webb (1987) and Flam and Staiger (1991) have used the Stiglitz-Weiss adverse-selection model to show that asymmetric information may justify infant-industry protection; banks overestimate the risk and therefore provide too little capital for an infant industry, whereas a tariff would encourage "safer" firms to enter the industry and thus encourage lower risk premia. Such arguments for welfare-improving tariffs based on capital-market imperfections presumably apply most to developing countries, and the best policy is capital-market reform to promote more sophisticated financial intermediaries.

7

not the first-best way of encouraging domestic production. Better measures go more directly to the distortion that prevented the infant's unassisted birth—for example, capital-market reform. In this ranking of measures to assist infant industries, a production subsidy is always superior to a tariff because it does not permit the abuse of domestic monopoly power.[8] If increasing returns to scale actually yield decreasing marginal costs, a subsidy may be welfare-improving, depending on the cost and demand curves (Corden, 1967). The presence of monopoly power reinforces this argument. Even if a subsidy is welfare-improving in theory, it may be difficult to implement; the potential producer may have unique knowledge of the firm's cost function and an incentive to conceal its true shape from policymakers and to overstate the size of subsidy necessary.

If costs decrease sufficiently for the new producer's marginal costs to be below the f.o.b. export price, infant-industry protection can be import-substituting and export-promoting and can increase national welfare. This scenario is a variant of the Figure 1 argument that has frequently reappeared in the literature.[9] Domestic consumers lose from tariff protection, but the domestic firm gains not only the monopoly rent in the home market but also the difference between average cost and revenue from exports.

Figure 2 illustrates a situation in which scale economies are important relative to the size of the domestic market. Even a prohibitive tariff would not allow a firm to make profits by selling solely to the domestic market. The role of exports is to increase total sales so that the firm moves down its average cost curve. With imports excluded from the domestic market, a domestic producer can sell OA units at a price P_d. By exporting AB units at the world price, P_w, average costs are reduced to AC^*. In Figure 2, the exports are sold at a loss because P_w is less than AC^*, but they increase total profit because P_w is greater than MC at all output levels up to OB. The firm is profitable if $(P_d - AC^*)OA + (P_w - AC^*)AB$ is positive.

Trade barriers may be welfare-improving, but they are never the first-best policy in situations where exports are sold at a loss (Figure 2). If the firm's existence is socially desirable, welfare can be achieved at

[8] This assumes a shadow price of unity for government funds. If it costs more than a dollar to raise a dollar of government revenue, the policy ranking may be reversed; see the discussion of Neary (1990) in Chapter 4.

[9] In addition to the references in the text, variants of the argument come up in Frenkel (1971) and Hsu (1972).

FIGURE 2

IMPORT SUBSTITUTION AS EXPORT PROMOTION
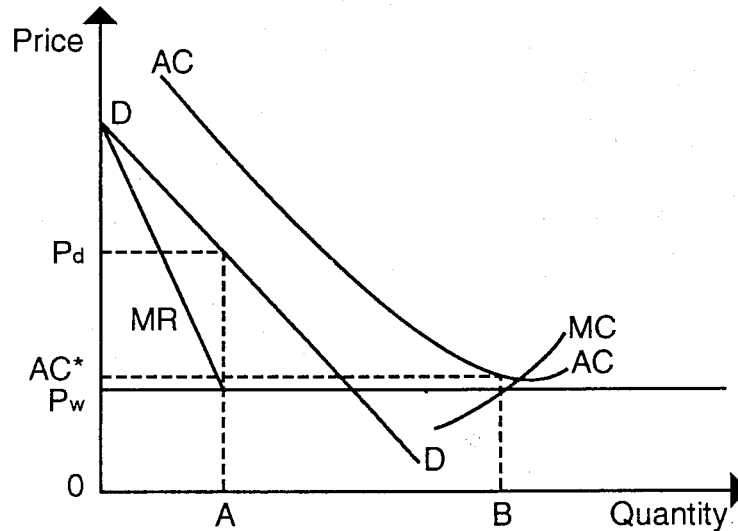
lower social cost by a subsidy, which reduces the loss of consumer surplus (Pursell and Snape, 1973). Whether reserving the domestic market for a home producer will increase national welfare or not is impossible to say. Basevi (1970) has pointed out that domestic output may be greater than, equal to, or less than the social optimum, and no policy prescription can be generalized; Krugman (1984) avoids all normative analysis because the comparison is between two second-best situations.

This class of argument in favor of trade barriers holds a strong attraction for policymakers. It is often applied to the success of Japan and the newly industrialized countries in collapsing import substitution and export promotion into a single step of an industry's development (see Yamamura, 1986, on Japanese TVs), although it tends to be accepted as a stylized fact rather than subjected to empirical scrutiny. If the model is empirically relevant, it would appear to be more applicable to small economies; Pomfret (1975) suggests some examples from Israel. In a larger economy, the prospect of supernormal profits in a protected domestic market may induce several entrants, who will then collude to share the market even though doing so involves operating at a suboptimal scale (and hence not exporting); Eastman and Stykolt

9

(1960, 1967) argue, with support from many industry studies, that this has occurred in Canada. In general, empirical evidence of the successful use of infant-industry tariffs to promote domestic production and increase national welfare is difficult to find.

3   MONOPOLY ABROAD (NO DOMESTIC PRODUCER)

With a single world producer, as with any pure monopoly, the market mechanism will not produce a welfare optimum. The particular problem about a foreign monopoly is that there is no global regulator to enforce an antitrust policy. Some global natural monopolies have been regulated successfully by international agreements (for example, the Universal Postal Union), but these are tightly circumscribed by considerations of national sovereignty. Typically, the available policy responses are national. Unilateral actions can increase global welfare if they force the foreign monopolist to reduce its price, hence increasing consumer surplus, or national welfare if they can appropriate part of the monopoly rent for the importing country. The rent-shifting argument is one of the very few logically valid arguments by which a tariff may increase welfare of a small country,[10] and it is central to the new mercantilist case for trade barriers.

Both Katrak (1977) and Svedberg (1979) show that "a country that obtains supplies of a product from a foreign monopolist may find that free trade is not the appropriate policy" (Katrak, 1977, p. 289). The point is simply illustrated by Svedberg for the case in which the monopolist's supplies are at constant cost over the relevant range of the importing country's consumption (see Figure 3). Imposition of a specific duty, AB, induces the monopolist to reduce supply from OQ_0 to OQ_1 and increase price from P_0 to P_1. The price increase is less than the tariff (that is, $AB > P_0P_1$) so that the monopolist's supply price falls. The importing country gains $ABCJ$ in tariff revenue and loses P_1P_0EF in consumer surplus; as long as the former exceeds the latter, the tariff increases national welfare (although global welfare is reduced).

A fall in the monopolist's supply price, a circumstance that Jones and Takemori (1989) call "normal," is not the only possible outcome. The impact of the tariff on the foreign monopolist's supply price depends upon the elasticity of demand (Jones, 1987), and, under certain condi-

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[10] Here and elsewhere in this paper, the term "small country" is used in the precise sense of a country that is unable to affect world prices, that is, it faces a perfectly elastic demand for its exports and a perfectly elastic supply of imports. Where imports are supplied by a monopolist, the small country is unable to affect the monopolist's marginal cost or to influence the monopolist's pricing decisions in the rest of the world.

FIGURE 3

THE RENT-SNATCHING TARIFF WITH A FOREIGN MONOPOLY
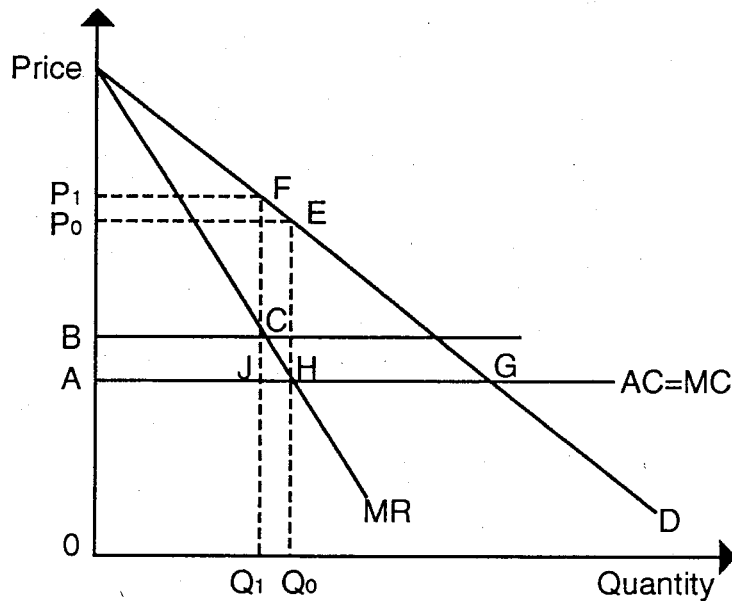
tions, the optimal tariff could be zero (with constant elasticity of demand, for example; de Meza, 1979) or even negative (that is, an import subsidy is optimal; Tower, 1983; Brander and Spencer, 1984b). Cases in which the foreign monopolist responds "perversely," for example, by raising its supply price in response to a tariff, are generally associated with demand curves highly bowed in toward the origin. Even in the "normal" case, in which the net welfare gain to the importing country is increased by a positive tariff, both Katrak and Svedberg suggest reasons why the tariff is not a true optimum.

Katrak argues that, although a tariff may be superior to doing nothing, an even better policy for the importing country is to impose a consumption tax. De Meza (1979) extends this argument by showing that price controls set just above the exporter's average costs will be the best policy.[11] The national-welfare gain in Figure 3 from such price controls

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[11] Katrak's result arises from the distinction between a tax on the charged-in-full (c.i.f.) price of imports and a tax on the domestic market price. Tower (1983) follows de Meza in arguing that price floors and ceilings are the best measures to deal with a foreign monopoly. This is strictly true only if the monopolist faces a linear demand curve and has

12

would be $AGEP_0$, which is larger than any possible rent-shifting gain because the maximum monopoly rent is $AHEP_0$. The price ceiling also leads to a global welfare gain over the laissez faire situation. De Meza (1979, p. 335) argues that the superior policy "requires no more information to compute the optimal maximum selling price than it does the optimum consumption tax," but it may be more difficult to enforce price controls than a customs duty and some governments may be reluctant on principle to control prices. Thus, the tariff may be preferred in practice to theoretically superior methods of increasing national welfare.

Svedberg's reservations about the Figure 3 analysis of the optimum rent-snatching tariff concern the monopolist's option of opening a subsidiary in the importing country in order to jump the tariff. This possibility complicates welfare conclusions, because, in the neighborhood of the "switchover tariff" (that is, the tariff at which it becomes more profitable for the foreign firm to supply this market from a subsidiary than through imports from its home base), the importing country may be better or worse off with a subsidiary; in the latter case, the optimum tariff will be below the switchover tariff. Similar considerations arise in the duopoly literature discussed in the next section.

Jones and Takemori (1989) have suggested a separate but related reason why a small country may increase its welfare by imposing a tariff on imports from a foreign monopoly. In an integrated world market with no transport costs or trade barriers, the monopolist is forced to charge the same price worldwide. With segmented markets, the supplier can increase its profits by acting as a discriminating monopolist and charging different prices in each market where the demand elasticity differs. Some countries would benefit and some would lose from segmentation, and the benefiting countries could induce their desired outcome by erecting trade barriers. With identical demand elasticities everywhere, this resembles the Katak-Svedberg result, but, with differing demand elasticities, the tariff can raise national welfare in many situations. In general, a country with higher demand elasticity benefits from a tariff that allows the monopolist to lower its supply price, whereas a country with lower demand elasticity is a free rider in the integrated world market, paying a lower price than it would with market segmentation. Complete segmentation allowing the monopolist to maximize profits must reduce

constant costs in supplying this market. Kowalczyk (1990) proves that, with increasing marginal costs, the optimal policy is an entry fee plus price ceiling and, with decreasing costs, it is a nonlinear price schedule, but, for all situations, the optimal price ceiling dominates the optimal tariff in terms of increasing national welfare.

the net welfare of nonproducing countries as a group, so that global welfare is increased by trade liberalization in a world of pervasive transport costs and trade barriers. Jones and Takemori show that even small countries may be able to use opportunistic trade barriers to take advantage of the second-best situation represented by a global monopoly.

The Katrak-Svedberg rent-snatching argument and the Jones-Takemori market-segmentation argument are logically valid but unlikely to be of great practical importance. It is difficult to think of actual examples of a single foreign supplier; de Beers' diamond monopoly is sometimes quoted but is of little relevance in this context, because ease of smuggling keeps most countries' tariffs on diamonds at or close to zero.[12] These arguments also ignore the behavior of the exporting firm's government, the optimal policy of which may involve levying an export tax (Auquier and Caves, 1979). Nevertheless, both arguments are significant in that they have important echoes in the literature on oligopoly, that is, in the Brander-Spencer analysis of rent snatching and the Smith-Venables work on market segmentation.

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[12] In some models of the industry of wide-bodied civilian jet aircraft, Boeing is assumed to be a monopolist in the absence of Airbus. This counterfactual assumption is implausible given the continued presence of McDonnell Douglas even in the post-Airbus market for midsized jets, and given Lockheed's stated intention of returning to the market. A referee for this paper suggested that Israel acts as a monopolist in the world orange market for part of the year, but this must be a brief period, given the number of other orange-growing countries. Similarly, the Organization of Petroleum Exporting Countries (OPEC) enjoys some monopoly power, but, even at its peak, the cartel was undermined by poorer members acting as free riders and by nonmembers supplying a substantial share of the world market.

14

4 DUOPOLY
(ONE FOREIGN AND ONE DOMESTIC PRODUCER)

Among the most influential contributions to trade theory in the 1980s was a series of articles by Brander and Spencer extending the rent-snatching argument to a duopoly setting. If the foreign firm's monopoly is based on scale economies (or any other non-firm-specific advantage), the possibility arises of domestic firms appearing as a result of trade barriers. Once a domestic firm is in place, there may be a case for imposing or raising a tariff in order to shift rents from the foreign to the domestic firm. The rent-switching argument appears to have a strong attraction to trade policymakers, especially in Washington and Brussels, although its theoretical foundations are not robust.

Let us again start by assuming that the domestic firm does not export. Brander and Spencer (1984a) show that the conditions for a tariff to be welfare-improving for the importing country are less stringent when there is a domestic producer than in the Katrak-Svedberg case of no home-country firm. A subsidy may or may not be superior to a tariff; there is more consumer surplus with the subsidy but less profit shifting from the foreign to the domestic firm.

Figure 4 illustrates the Cournot duopoly case. A home and a foreign firm producing a homogeneous good both select their output assuming the other's supply is fixed; $h(Q_f)$ is the home firm's reaction function, and $f(Q_h)$ is the foreign firm's reaction function, so that C is the Nash equilibrium. Two iso-profit lines for the home firm are traced out by π_0 and π_1. Imposing a tariff is equivalent to increasing the foreign firm's marginal costs; it shifts the foreign firm's reaction function to the southeast and leads to a new equilibrium at F. The same higher level of home-firm profits can be achieved by a subsidy shifting $h(Q_f)$ to the right until it passes through G. The subsidy involves a smaller cost to domestic consumers because sales are higher and domestic price is lower at G than at F, but the tariff has the added national-welfare benefit of transferring rent from the foreign firm to the home government. The key point is that the domestic firm cannot achieve the higher profits by itself, because F is off the foreign firm's no-tariff reaction function (so the foreign firm will increase its supply) and G is off the domestic firm's no-subsidy reaction function (so its threat to hold sales at this level is not credible because it could, given the foreign firm's

15

FIGURE 4
COURNOT DUOPOLY IN THE DOMESTIC MARKET
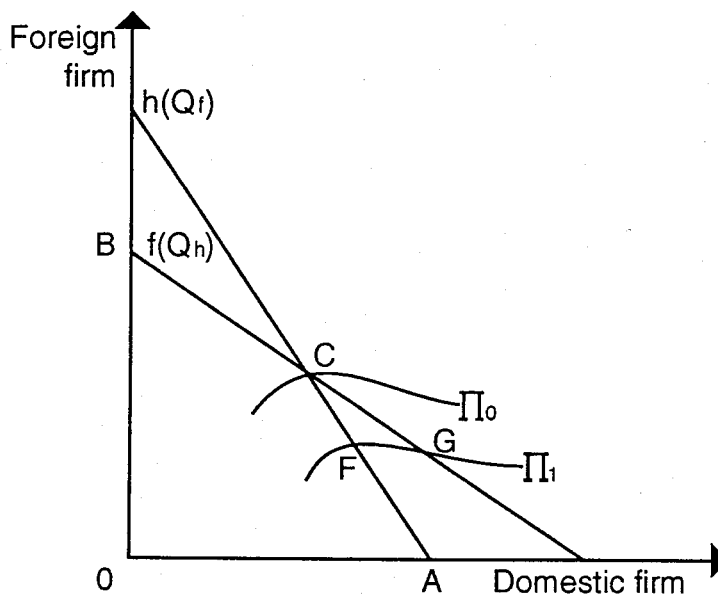
output, make greater profits by reducing sales and raising the price). Government action can make it unprofitable for the foreign firm to increase supply at F or for the domestic firm to cut supply at G. In the case of a subsidy, the domestic firm credibly assumes the role of Stackelberg leader.

If there is no preexisting domestic firm, but a sufficiently high tariff can induce domestic entry, the situation is more complex. The optimal tariff may be just below the entry-inducing level (Brander and Spencer, 1981)—a result analogous to Svedberg's "switchover tariff." Once the domestic firm is in place, however, domestic welfare may be increased by raising the tariff further in order to shift more rents from the foreign to the domestic firm. In all of these cases, the tariff reduces global welfare. Moreover, the foreign monopolist's home government has an incentive to intervene to deter new entry (Dixit and Kyle, 1985), and such a one-shot negative-sum game does not have a clear outcome.[13]

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[13] A very influential, but extremely simple, version of this game is presented in Krugman (1987) and twice reprinted in The Economist (November 12, 1988, p. 75, September 22, 1990, p. 19). Krugman called his example "Boeing-Airbus," and constructed

In a Cournot duopoly in which both countries' firms export, there can be intra-industry trade as each firm seeks a share of the monopoly rent in the other firm's market. In the reciprocal-dumping model of Brander and Krugman (1983), with zero transport costs or trade barriers and constant marginal costs (which are the same for both firms), the outcome is equal sharing of both markets. Positive transport costs or tariffs increase a firm's domestic market share. In this model, international trade is procompetitive, because it forces price closer to marginal cost in both markets, but trade may be welfare-reducing if transport costs are high.

When a home and a foreign firm compete in a third market, Brander and Spencer (1985) show that an export subsidy can be the optimal policy for the home country. As in Figure 4, with a single home firm and downward-sloping reaction curves,[14] the output of a Stackelberg leader is higher than the Cournot-Nash equilibrium output and yields a higher profit to the home firm and greater welfare to the home country. The Brander-Spencer point is that a credible government precommitment to an export-subsidy policy induces the home firm to produce at the Stackelberg level and upsets the Cournot-Nash equilibrium to the benefit of the home country.

Research and development (R & D) subsidies made prior to production decisions are an alternative method of improving home-country welfare, although the optimal package will not include both export and R & D subsidies (Spencer and Brander, 1983). The export-subsidy case is a controversial result, because an export tax may increase the welfare of a large country in traditional trade theory, but an export subsidy is always welfare-reducing; this conclusion follows because an export subsidy reduces the world price (that is, it has negative terms-of-trade effects). In the duopoly setting, however, any terms-of-trade effect is taken into account in the home firm's production decision.[15]

Even within Brander's and Spencer's chosen Cournot duopoly setting,

the payoff matrix so that a small subsidy to *A* would bring *A* into production and drive the incumbent *B* out of the industry; because a single producer earns high rents in Krugman's example, the subsidy transfers rents from *A* to *B* with a net welfare gain for the latter's country. This simple game seems to bear little similarity to the actual Boeing-Airbus competition discussed in Chapter 7, in which a subsidy induced *A* to enter but *B* remained.

[14] This is the usual assumption, although some functional forms (for example, constant-elasticity demand curves) imply upward-sloping reaction curves and, hence, export taxes as the optimal policy (Collie and de Meza, 1986).

[15] The point of the "no domestic sales" assumption in Brander and Spencer (1985) is to abstract from any welfare effects on consumers and thus to focus on producer rent as the sole source of domestic welfare.

the case for an export subsidy is not strong. First, it assumes that a government precommitment is in some sense more credible and inflexible than the precommitment of a large firm.[16] Second, as in the Katrak-Svedberg setting, price controls are a superior policy (de Meza 1989).[17] Third, if both governments move simultaneously to give an export subsidy to their own firm, the outcome is a prisoner's dilemma with both countries worse off as a result of adopting interventionist policies; neither country can risk unilateral free trade because the other might then follow the Brander-Spencer policy. The best policy is, thus, multilaterally agreed-upon free trade.

Krugman (1984) analyzes a Cournot duopoly in the presence of scale economies. Here, a tariff helps the domestic firm to win a larger market share both domestically and internationally because it moves down the falling cost curve; meanwhile, the foreign firm's loss of market share forces it up the marginal cost curve. Although Krugman is careful to emphasize that the welfare effects will be extremely complex in this comparison between second-best situations, a tariff is likely to produce more domestic welfare gain with scale economies and a domestic firm than in the original rent-snatching settings. In addition, the Brander and Spencer (1985) export-subsidy argument could plausibly be welfare-increasing (although not the first-best policy) in the presence of economies of scale.

The duopoly models prove that interventionist trade policies can increase domestic welfare under certain conditions. Although the insight may be seen as providing theoretical justifications for protectionism in imperfectly competitive markets, the result is extremely fragile. The optimal policy is sensitive to assumptions about the nature of oligopolistic interaction and about entry. It may also fail to hold in a general-

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[16] Debates over credibility of precommitments are inconclusive, because credibility depends upon perceptions of whose hands are truly tied. Saxonhouse (1987, pp. 241-242) has suggested that, although the Japanese government has not made such precommitments, Japanese firms may have played on Western ignorance by advertising their connections to the Ministry of International Trade and Industry (MITI) and convincing foreign firms to produce below their Cournot equilibrium out of fear of being unable to compete with Japan Inc: "Is it possible that in the face of considerable ignorance by foreigners, Japanese firms are trying to scoop up all the benefits of a credible government commitment without actually imposing any real cost on the government?"

[17] One referee suggested that, although price controls are best in the simplified models, their value is fragile to slight generalizations regarding uncertainty, imperfect information, and underlying inflation. The point is well taken, and the more practical arguments about retaliation, entry, and general-equilibrium consequences are emphasized in the conclusions to this chapter.

equilibrium setting. Finally, the opportunities for rent snatching appear to be empirically insignificant (Dixit, 1986); the empirical evidence is reviewed in Chapter 7 below.

Under the Cournot assumption, firms take their rival's output as given and act to maximize profits. If, instead, firms take their rival's price as given, as under the Bertrand assumption, the optimal policy is neither a tariff nor an export subsidy but an export tax (Eaton and Grossman, 1986).[18] Figure 5 illustrates Bertrand competition between a home and a foreign firm in a third market. The Bertrand equilibrium is at B, where the home firm's reaction function $P_h(P_f)$ intersects the foreign firm's reaction function $P_f(P_h)$. Given the foreign firm's reaction function, the best possible outcome for the home firm is the Stackelberg equilibrium at point S, where the home firm's profits are maximized at

FIGURE 5

BERTRAND DUOPOLY IN A THIRD MARKET
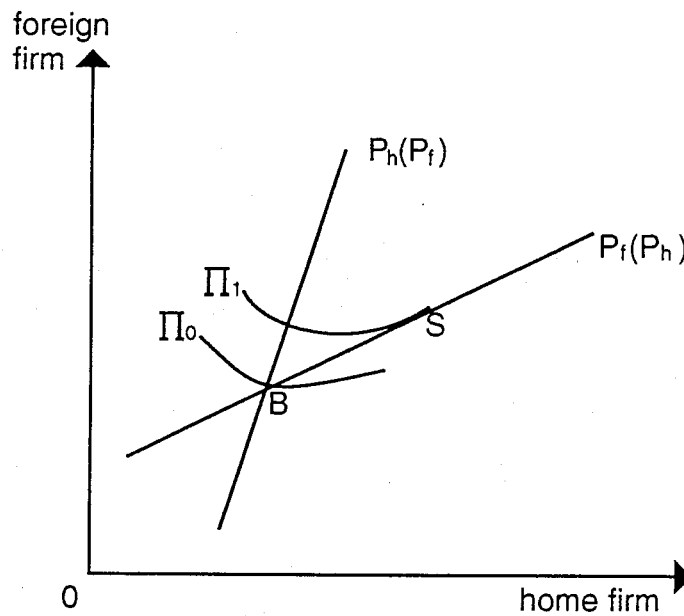
[18] The Bertrand assumption must be combined with dropping the homogeneous-product assumption or else the result collapses to the competitive equilibrium of price equal to marginal cost. The conclusion that a trade tax is optimal is then simply a restatement of the optimal-tariff argument.

the level associated with iso-profit curve π_1. Reaching S requires a credible commitment by the home firm to a higher price than that associated with B, that is, the appropriate policy is an export *tax* by the home government.

The Cournot and Bertrand behavioral assumptions both pertain to one-shot, single-move models, with no collusion. In reality, of course, firms interact repeatedly in a dynamic setting, and there are opportunities for players to learn from their rival's past actions.[19] An alternative noncooperative behavioral assumption is that each firm makes its strategic choice, using all available information to predict its rival's reactions. These conjectures are "consistent" when they coincide with those that would result from small strategic deviations around the equilibrium point. Although still essentially static, the consistent-conjectures assumption captures certain aspects of dynamic interaction.

Eaton and Grossman (1986) originally claimed that, with consistent conjectures, firms would achieve the optimum without government intervention (that is, free trade is optimal). Subsequently, Csaplar and Tower (1988) showed that positive tariffs or export subsidies may be optimal even when consistent conjectures are assumed.[20] The difficulty with the consistent-conjectures assumption is that the conjectural-variation parameter may itself depend on policy variables. Thus, a government may be able to introduce a distortion that is superficially welfare-reducing but that feeds through the foreign firm's reaction function and back into the domestic firm's reaction function in a way that is ultimately welfare-increasing. The nature and level of the optimal policy may thus be complicated, because the conjectural variation is a function of tax parameters and cannot be assumed to be constant across different policy experiments (Vousden, 1990, p. 138). Eaton and Grossman (1988) give an example of such a feedback and conclude that "such policies are not believable" and that analysis of policies operating

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[19] Cournot outcomes can result from a two-stage game in which firms initially select production capacities and then simultaneously set prices, that is, the Cournot assumption can be justified on the (reasonable) technological grounds that price can be adjusted faster than output. This justification is typically made by referring to Kreps and Scheinkman (1983), but Cournot outcomes also require further restrictions on the ways firms ration sales when they face excess demand at their chosen price. Tirole (1988, pp. 216-221 and 228-234) reviews this and other limitations to the Kreps-Scheinkman analysis.

[20] Driskill and McCafferty (1989) introduce output-adjustment costs and show that the steady-state output level is greater than under Cournot competition but less then in Eaton's and Grossman's consistent-conjectures model, so that the optimal policy is an export subsidy.

through changes in rivals' beliefs requires "a truly dynamic framework."[21]

The general point is that no simple policy recommendation applies to all behavioral assumptions (so that policymakers may adopt the wrong policy because they have misunderstood the nature of oligopolistic interaction in the industry), and the true optimal policy may in fact be extremely complex (so that, even if policymakers identify the correct policy, they may be incapable of implementing it precisely).

The original Brander-Spencer result makes no allowance for policy measures by the foreign government. In the plausible case in which the subsidized firm exports to the other producing country, the second country's government can do better than allow free trade. The optimal response is a combination of production subsidies or taxes (to eliminate the domestic duopoly distortion) plus a partly countervailing tariff (to capture rent from the foreign firm), with the appropriate mix depending upon demand and cost conditions as well as the form of duopolistic competition (Dixit, 1988a; Cheng, 1988). Retaliation greatly weakens the possibility of a welfare-increasing export subsidy. When the optimal policy response is made by the second country, there is no profit-shifting argument for an export subsidy if demand is linear; indeed, the first country's best policy is an export tax (Collie, 1990). With nonlinear demand, the export subsidy remains welfare-increasing if the foreign government makes the optimal policy response, but not if it responds with only a countervailing tariff. Collie (1991) argues that the latter is the practically relevant case, and the foreign country will always gain from an export subsidy, whereas the subsidizing country usually loses (and would do better to tax exports); thus, the conventional conclusion about export subsidies remains valid in practice. An alternative practical outcome, referred to above, is a prisoners' dilemma in which both governments offer subsidies, which may leave both countries worse off but may benefit the two firms and consumers worldwide.[22]

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[21] In the first draft of this paper, this paragraph aroused strong reactions. One reader, following Laitner (1980) and Boyer and Moreaux (1983), argued that, if conjectures are conditional on one's own and one's rival's output, many output pairs can be supported by "consistent conjectures," and the concept has no theoretical power. Another reader believed consistent conjectures were given too short shrift and that it was "crazy" to devote so much space to the simple-minded conjectures of Cournot and so little to the more general model.

[22] Neary (1990, 1991) discusses two other practical aspects that produce similar paradoxes. First, if the shadow price of government funds is greater than one, a subsidy that increases profits may reduce national welfare; Neary finds that, for many cases, the

The Cournot duopoly results are also sensitive to the assumption of no entry. Strategic trade policy arguments for protection are also applied to oligopolies with more than two firms (see Chapter 5), but the substantial point is whether or not the number of firms can be made endogenous through a zero-profit constraint (net of any entry costs). Venables (1985) shows that allowing free entry in the Brander-Krugman reciprocal-dumping model makes trade invariably welfare-increasing, and any trade barriers are welfare-reducing. Markusen and Venables (1988) provide a taxonomy of results for segmented markets, and Horstmann and Markusen (1986) consider the case of integrated markets and imperfect substitutes; in the latter case, tariffs lead to inefficient entry along Eastman-Stykolt lines.[23] These three papers show an array of possible results, which are very sensitive to assumptions about entry. In general, however, allowing further entry substantially undermines the duopoly-based arguments for trade barriers because rents are driven to zero and there is no scope for rent snatching. Tariffs may be especially harmful because they permit inefficiently large numbers of firms in sheltered oligopolistic industries.[24]

Dixit and Grossman (1986) have identified another possible drawback to policy rules based on simple duopoly models. Policymakers' attempts to "pick winners" by strategically supporting domestic producers in concentrated industries typically center on a small set of industries. If the set of industries uses a specific factor (for example, scientists in high-tech industries), stimulation of one industry will have negative spillover effects on the other industries in the set if the supply of the

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cutoff point for this shadow price (above which an export subsidy is not optimal) is at the low end of empirical estimates of the opportunity cost of acquiring government funds. Second, if subsidies are awarded after contracts are made, they are less likely than *ex ante* subsidies to raise national welfare, but both home and foreign firms' profits will be larger with *ex post* subsidies; there is some evidence (Carmichael, 1987) that *ex post* subsidies, such as those provided by the U.S. Exim Bank and similar export-credit agencies, are the most common export subsidies. Neary concludes that export subsidies justified by profit-shifting arguments and the predilection for *ex post* subsidies both reflect the "capture" of regulators by producers.

[23] The Horstmann-Markusen model is close in spirit to the applied general-equilibrium model used by Harris (1984) and Harris and Cox (1984) to estimate the gains from trade liberalization by Canada (see Chapter 7, Section 2 below).

[24] Ethier (1979) had earlier made the related argument that scale economies may provide a strong argument in favor of free trade. If realization of scale economies is limited by the size of the market (as in Adam Smith), each country can maximize the realization of scale economies by its firms if it removes all trade barriers and integrates into the world market; any trade barrier reduces global efficiency.

specific factor is fixed over some time horizon. It is difficult to situate these duopoly models in a plausible general-equilibrium setting because the industry may be a small part of the national economy, but ignoring inter-industry links is a serious weakness.

Srinivasan (1990) makes the more general point that the imperfect-competition literature rarely takes into account the basic result from the theory of distortions and the second best:

> A policy that is optimal in the presence of a single distortion—say, a noncompetitive structure in the market for one good—need not be optimal when several other distortions are present. It goes without saying that no economy in the world, developed or developing, is characterized by a single distortion. (p. 219)

This point is in itself neither a justification for or against interventionist policies in imperfectly competitive markets, but it does commend some humility in advocating specific policies. A policy recommendation may seem plausible on the basis of partial-equilibrium analysis yet turn out to be inappropriate from an economywide perspective.

5 OLIGOPOLY

Many of the duopoly results have been carried over to oligopoly settings with more than two firms. In the Brander-Spencer duopoly model, increasing the number of home firms reverses the result in that an export tax, and not an export subsidy, becomes the optimal policy. The extra competition eventually raises home output above the single-firm Stackelberg level maximizing national welfare, and the required prior commitment is to reduce rather than increase domestic output (Dixit, 1984). Chapter 6 analyzes differentiated products in which local monopoly power introduces the possibility of welfare-improving trade barriers, but the usual model involves free entry and is thus not strictly oligopoly theory. In practice, the most likely implications of a larger number of firms are that, if the optimal-trade policy involves intervention, it will be more complex than in a duopoly setting and, assuming lower barriers to entry, the presumption that free trade is the best policy will be stronger.

The most interesting development in applying oligopoly theory to open economies is the idea of trade barriers as "facilitating practices," that is, even if the trade barrier is welfare-reducing, it may be popular with the oligopolists because it raises their joint profits. This is one of the few cases in which powerful lobbyists in both the importing and the exporting countries benefit from import restrictions and hence conspire toward the introduction of trade barriers. Such a situation may endanger the liberal international trading system because protectionism historically has been restrained by fear of retaliation by the exporting country, a threat that may be absent in this setting.

In the Cournot duopoly setting of Figure 4, the firms' joint profits are maximized at points along the imaginary line connecting the monopoly positions A and B (sometimes referred to as the contract curve). The triangle ABC contains points at which the two firms earn higher combined profits than at the Nash equilibrium, and perhaps also points at which both firms are better off than at the strategic trade policy outcomes F and G (although home-country consumers' and home-country national welfare are lower). If the home firm is more concerned about its rival's reaction (including retaliatory measures by the foreign government) than about the welfare of its fellow citizens, it will prefer a measure that increases joint profits over pure rent-switching. A voluntary export restraint (VER) agreement can be such a measure.

Harris (1985) shows that, in a Bertrand duopoly, both the foreign and the domestic firm benefit from a VER if it is set at the free-trade level of imports. If the VER is set at the free-trade level, the home firm faces a different strategic situation than that which led to the previous Nash equilibrium. The home firm can increase its price without fear of the foreign firm cutting its price in order to increase sales. The new equilibrium is at a higher price and profit level for the home firm. The foreign firm is also better off because its price can go up and its sales are unchanged. For VERs set below the free-trade level of imports, prices will increase, giving the home firm larger profits and the foreign firm smaller profits than under the VER at the free-trade level. In general, a VER increases joint profits, but the distribution of profits depends upon the size of the VER.

The above result, however, is sensitive to the behavioral assumptions. Krishna (1989a) derives a similar conclusion without invoking the first-mover assumption for the home firm, but, in her Bertrand model, the outcome depends upon the firms' products being substitutes and on the rationing rule adopted (she assumes costless arbitrage). In a Cournot duopoly, the VER at the free-trade level is equivalent to free trade, whereas, with behavior more collusive than Cournot, the foreign firm suffers from a VER (Mai and Hwang, 1988).

The more general point is that a VER enhances collusion among oligopolistic firms by allowing the group of restrained foreign firms to make a credible commitment not to increase their output above the VER limit when domestic firms increase their prices. Such a precommitment enables the global industry to come closer to reaping maximum monopoly profits in the importing country. This idea was pioneered by Itoh and Ono (1982) and Ono (1984) and popularized in an influential paper by Krishna (1989a), who introduced the phrase "facilitating practices."[25]

Lambson and Richardson (1987) have tried to develop more specific conclusions. They assume a Bertrand oligopoly with tacit collusion among firms, which enforce agreement by reducing prices in the event of defection. A VER strengthens collusion because foreign firms have less incentive to cheat by lowering prices when the VER limits the subsequent increase in their sales; this is similar to the standard Harris-

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[25] Although Krishna's paper was published only in 1989, it had been circulating as an unpublished 1983 manuscript from Princeton University (quoted in Dixit, 1984) and as a 1985 NBER Working Paper, which has frequently been cited in the literature on imperfect competition.

Krishna facilitating effect. In the Lambson-Richardson model, however, there is also a collusion-weakening consequence of a VER insofar as domestic firms are less open to penalties if they cheat on the agreement because the foreign firms are limited in their potential for increasing sales by cutting prices. Thus, the net effect of a VER on competition is ambiguous in their model.[26]

Although the recent literature on facilitating practices has been based on duopoly theory and game theory, the simplest starting point for this literature is the Bhagwati equivalence proposition in the presence of a domestic monopoly (see Chapter 2, par. 4). In Figure 6, the imposition of a quota (*AE*) allows the domestic firm to exercise its monopoly power by restricting output in order to push up domestic price and increase profits. The quota also benefits the holders of import licenses, who, by charging the higher domestic price when selling imported goods purchased at world prices can earn rent *WXZY*. The destination of this rent will actually depend upon the structure of the world industry; if there are few foreign firms, they may be able to keep the quota rent for themselves. The transfer of the rent to the foreign suppliers is especially likely if the quota takes the form of a VER. Because the use of VERs has been growing rapidly since the mid-1970s, they have been a popular research topic.[27]

The proposition that both the domestic and the foreign firms can benefit from a VER is easy to establish using Figure 6, but there is a degree of indeterminacy insofar as the optimal size of the VER is different for the two groups of firms (for the domestic firms, a zero quota is best). It is also possible that the home-country government has "strategic" motives of its own. The Canadian auto VER introduced in 1981 appears to have been intended to encourage production in Canada by subjecting the Japanese suppliers to competition from unrestrained Korean imports (Pomfret, 1989b).

There is some evidence from the 1980s that VERs have had the mutually beneficial consequences predicted by Krishna—for example, in autos and VCRs—even if there have been potential shortcomings from the perspective of the firms (Pomfret, 1989b). The main shortcoming of a VER negotiated with specific supplying countries is the possibility of

[26] Krishna (1989b) surveys the literature on strategic interaction and VERs.

[27] Not all VERs involve oligopolies. Many VERs on exports of labor-intensive goods from developing countries (such as the bilateral quotas under the Multifiber Arrangement) involve fairly atomistic industries in the importing country. For a more general survey of the economics of VERs, see Pomfret (1989a).

FIGURE 6

AN IMPORT QUOTA (OR VER) WITH A DOMESTIC MONOPOLY
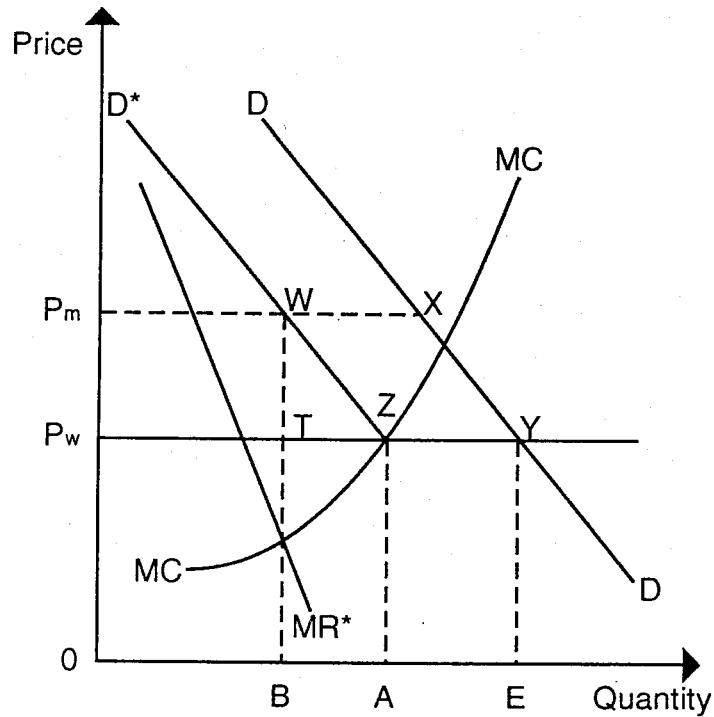
the higher price attracting new entrants. Even in an industry with relatively high barriers to entry, such as autos, the North American VERs on Japanese suppliers contributed to the entry of South Korea. In Italy and France, restrictive VERs on Japanese autos were undermined by trade diversion to other European Community (EC) suppliers whose sales could not be regulated. The unrestrained suppliers may act as a competitive fringe, limiting the exercise of market power by domestic firms, but still remaining under the threat of a VER if they are too successful at supplying the market. European car exporters to the United States acted as pure free riders after the 1981 VER with Japan was introduced, but Korean suppliers increased their sales in Canada with the tacit commitment of the Canadian government not to impose a VER. The consequences of introducing unrestrained suppliers are

27

difficult to model, although it is likely that prices will increase as the probability rises that VERs will be applied to additional suppliers (Dean and Gangophadhyay, 1991). Even before a VER exists, the threat of it may induce foreign firms to behave strategically—by increasing their sales, for example, so as to negotiate a larger market share when a VER is negotiated (Yano, 1989).

The "facilitating-practices" idea helps to explain some of the spread of nontariff barriers since the mid-1970s. Strategic trade policy based on the rent-snatching or rent-switching arguments presented above is by its nature confrontational. Thus, such policies tend to be espoused only by the largest trading units—for example, the United States and the EC, which have the least to fear from retaliation. Voluntary export restraints that benefit producers in both the exporting and the importing country are less likely to encounter significant opposition, given the relative lobbying power of producers and consumers, even though they are welfare-reducing for the importing country.

6 MONOPOLISTIC COMPETITION

The starting point for the "new" international economics was the empirical finding that much of international trade involved the simultaneous exchange of similar goods, that is, intra-industry trade rather than the inter-industry specialization and trade suggested by traditional theories. The pioneers of empirical work on intra-industry trade (Grubel and Lloyd, 1975; Balassa, 1967 [1989]) suggested variety-specific scale economies as the most plausible explanation of intra-industry trade in manufactured goods. This suggestion led to modeling international trade in a monopolistic-competition setting (that is, a large number of producers making differentiated varieties of a product under conditions of free entry).[28] The literature on monopolistic competition reflects these origins insofar as many contributions are intended to show the possibility of intra-industry trade, rather than to focus on trade policy.[29]

Monopolistic competition is easier to model than oligopoly, because strategic interactions among firms are negligible. Free entry leads to equilibrium in which each firm maximizes profits ($MC = MR$) without making monopoly profits (price $= AC$). Product differentiation means that no firm faces perfectly elastic demand for its product, so price is above marginal cost. The simple message is that, compared to perfect competition, monopolistic competition introduces an element of inefficiency; firms do not produce at the minimum point on their average cost curve, and, at the margin, the social benefits from an extra unit exceed the social costs. Presumably, this welfare loss is offset by the variety

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[28] Another important influence was the development of new monopolistic-competition models in the mid-1970s by Spence and by Dixit and Stiglitz; the love-of-variety model described below is often referred to as the SDS model after these authors. Dixit and Norman's 1980 textbook was an early attempt to indicate the relevance of the SDS model in explaining intra-industry trade.

[29] What is shown in the statistics as intra-industry trade may be traced to aggregation over commodities, over space or over time, and hence need not require any new theory to explain it (Srinivasan, 1990, p. 218). Monopolistic-competition models and some oligopoly models (for example, the Brander-Krugman reciprocal-dumping model) can generate intra-industry trade. Whether imperfect competition is an empirically significant determinant of observed intra-industry trade, however, remains unproven. Competing explanations of intra-industry trade are dealt with more thoroughly in Greenaway and Milner (1986) and Pomfret (1986) and in their debate in the June 1985 *Economic Journal*.

provided by a range of differentiated versions of the product.

There are many variants on the monopolistic-competition model, depending upon how the consumer's utility function is specified. One way of organizing these variants is to focus on the nature of product differentiation, which can be "horizontal" (that is, with no quality differences) or "vertical" (with quality related to cost). Horizontal product differentiation may exist because of consumers' love of variety or because different consumers have differing ideal varieties.

In Krugman's (1979 and 1980) papers, which started the imperfect-competition revolution in trade theory, consumers are assumed to like variety. Each variety enters symmetrically into the representative consumer's utility function so that, with diminishing marginal utility to each variety, more varieties yield higher utility. Cost curves are also modeled as simply as possible; a fixed-cost component ensures the standard situation of monopolistic competition in which firms produce under conditions of falling average costs. International trade allows producers and consumers to operate in the world market for each variety, enabling firms to move down their cost curves and consumers to buy varieties not produced domestically. Thus, international trade increases welfare not only by the traditional gains from specialization but also from the increased number of varieties available to consumers. The pattern of trade is indeterminate in the simple Krugman model, but it is not difficult to introduce assumptions that lead to each country producing varieties corresponding to strong domestic preference or Heckscher-Ohlin considerations of comparative advantage (Hocking, 1980; Helpman, 1981; Helpman and Krugman, 1985, chaps. 6-8).

Despite the enhanced gains from trade in Krugman's monopolistic-competition model, trade barriers may still increase national welfare because it is a second-best situation. Price is above domestic firms' marginal cost, and policies that shift consumption from imported to domestically produced varieties may be welfare-increasing. These potential gains must be weighed against any reduction in the number of varieties available.[30]

Flam and Helpman (1987) use a two-sector model with a monopolistically competitive and a perfectly competitive sector to establish a ranking, from best to worse, of a small tariff, output subsidy, and export

[30] The number of varieties may remain unchanged under some conditions. For example, demand elasticities are independent of consumption levels and the trade barriers are nonprohibitive tariffs. Gros (1987) analyzes this aspect of Krugman's model and also the differential effects of tariffs, export taxes, quotas, and VERs.

subsidy. The tariff is best because of the positive terms-of-trade effect as the domestic price of imported varieties is increased; the terms-of-trade effect is ambiguous with a production subsidy and negative with an export subsidy. This is a traditional optimal-tariff result because, as modeled, the home country is "large" in the monopolistically competitive sector.

Helpman (1990b, pp. 13-19) has clarified the net welfare effects of a tariff. The terms-of-trade effect must be positive, *ceteris paribus*, that is, if the number of varieties and output of each variety are held constant. The increased relative price of domestic varieties may either increase or reduce national welfare and the number of varieties. The reason for ambiguity is classically second best; a tariff distorts two sets of relative prices, that between domestic and foreign varieties, and that between protected differentiated products and other goods and services. If the resource misallocation due to the latter distortion is sufficiently strong, national welfare can be reduced by a tariff on differentiated products. The crucial determinant of the net welfare effect is the relative magnitude of the elasticity of aggregate demand and the elasticity of substitution, which determines the relative strength of intra-sectoral and inter-sectoral shifts. As with the oligopoly results, this conclusion is sensitive to the assumed absence of retaliation.

Similar results to those set out by Helpman arise from the ideal-variety approach to horizontal product differentiation, which has been developed by Lancaster (1979, 1980, 1984). In Lancaster's model, consumers have differing preferences, and each consumer purchases the variety of the product that comes closest to matching his or her pre-ferred bundle of characteristics. A greater number of varieties increases welfare because it allows some consumers to move closer to their ideal variety. Trade barriers in this model encourage greater consumption of domestic varieties, in turn encouraging new entry and a greater number of domestic varieties. In some circumstances, the tariff revenue plus the lower prices of domestic varieties (forced down by new entry) may more than offset the welfare loss due to higher prices for imported varieties, but the outcome is very sensitive to specific conditions. In particular, if domestic varieties tend to be bunched together in the spectrum of varieties, trade barriers are more likely to be welfare-reducing; only if domestic varieties are "interleaved" among imported varieties is a welfare gain possible.

Falvey (1979, 1981) has modeled vertical product differentiation, in which varieties are distinguished by quality. His model is useful for generating intra-industry trade under mildly restrictive assumptions.

31

Falvey and Kierzkowski (1987) extend the model by relating demand for quality to income levels, thus providing support for the Linder thesis and for the Armington assumption as a useful approximation in empirical work. It is, however, unnecessary to assume imperfect competition in the Falvey model. Shaked and Sutton (1984) have developed an alternative model of vertical product differentiation in which quality is exogenously given and quality improvements are determined by R & D expenditure. There is, thus, a tendency toward small numbers of firms because high spending on R & D results in a product of higher quality, and firms producing lower quality goods are driven out of the market. Krishna (1989b, pp. 22-27) surveys the large, but rather inconclusive, theoretical and empirical literature on quality.

The literature incorporating monopolistic competition into international trade theory was very extensive during the 1980s and has been the subject of many surveys.[31] The implications for trade policy are unclear, and it is fitting that Lancaster—one of the originators of the theory of the second best—is involved. Cases in which tariffs can be welfare-increasing are possible to construct, but the general presumption appears to be that free trade is the best rule of thumb. In two important respects, the gains from trade are likely to be larger under conditions of monopolistic competition than in perfect competition: first, the extra varieties available from participation in the world market will generally increase welfare, and, second, domestic firms are likely to move down their average cost curves (given the characteristic monopolistic-competition result of production to the left of the minimum point on this curve). Trade barriers could conceivably lead to each domestic firm enjoying increased market share, thus bringing marginal cost closer to price, and could increase the number of domestically available varieties; the opposite outcomes are also possible, however. Trade barriers on differentiated products will improve a country's terms of trade in the absence of retaliation, but the use of barriers is a confrontational policy. On balance, they are more likely to reduce the gains from trade and perhaps to lead to inefficient entry.

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[31] See, for example, Greenaway and Milner (1986), Helpman and Krugman (1985, chaps. 6-8, 1989, chap. 7), Helpman (1990b), and Vousden (1990, chap. 7). The latest development is to extend the static monopolistic-competition model into a dynamic framework in which firms incur product-development costs that are recouped from monopoly profits (Grossman and Helpman, 1990).

7 EMPIRICAL STUDIES

Empirical work consists of simulation studies based on calibrated models or case studies, sometimes degenerating into anecdotal evidence. These approaches are not very convincing. Although we can have most confidence in the more-studied industries in which a variety of approaches have been tried, some of the most quoted cases have unfortunately been least subject to rigorous empirical scrutiny (for example, the Boeing-Airbus duopoly).

Published research is limited to a handful of studies. This chapter describes the most influential of these studies, then examines attempts to incorporate imperfect competition into computable general-equilibrium models (CGE) in order to evaluate alternative trade policies. None of the studies described finds significant excess profits, so the last part of this chapter surveys alternative evidence on the existence of rents that could be appropriated by strategic trade policies.

Partial-Equilibrium (Industry) Studies

The most popular, and apparently most rigorous, approach (at least, among economists) has been to specify a model of imperfect competition for the industry under study. Elasticities and so forth are then determined either econometrically or, more usually, taken from the existing literature. The model can then be calibrated by setting remaining parameters (for example, behavioral parameters) so that the model reproduces actual values for endogenous variables. By changing the policy variables, the consequences of various policies can be simulated.

As with any similar work, the results depend upon how well the chosen model captures the actual market structure and behavior; there are, however, some added problems. First, the Lucas critique applies with particular force in this context. The parameters themselves are likely to change as a result of policy changes, because different policies may lead to different market structures and oligopolistic interaction is itself likely to be changed by policy changes (according to the theory underlying strategic trade policy). Thus, even if the modeler accurately represents the current market structure and behavior, the simulations are unlikely to capture behavior under new conditions. Second, literature-based estimates of parameters often involve a large subjective element in the selection process. Krishna, Hogan, and Swagel (1989)

redo Dixit's (1988b) calibration exercise for the auto industry, using alternative estimates, and find that not only the magnitude but also the sign of the optimal policy changes (it is a subsidy on imports, rather than a tax); worse still, following the policy recommendations emerging from Dixit's exercise would lead to a welfare loss if Krishna, Hogan, and Swagel have the correct model.[32] A worrying aspect of this type of empirical work is that it is virtually impossible to test the results in any meaningful way; all that can be done is to ask whether the model is logically consistent and the parameter estimates plausible and to conduct sensitivity analysis of changes in specification or in parameters. The counterfactual results cannot be checked against a reality that never existed, however, and we can never discriminate between, say, the Dixit and the Krishna results.

Baldwin and Krugman (1988b) have performed a simulation exercise for the market for 16K random-access memory chips (RAMs). Chip technology was dominated by the United States until the late 1970s, when comparative advantage shifted to Japan, and the question is whether Japan acquired a comparative advantage naturally or by protecting the home market. Baldwin and Krugman model production with decreasing unit cost, reflecting the learning process, and oligopolistic interaction by conjectural variations.[33] Thus, their model incorporates the central theme from Krugman (1984) of import protection as export promotion in the presence of learning effects and the existence of

[32] Krishna, Hogan, and Swagel also alter Dixit's assumption that products are only differentiated by country of origin to allow for product differentiation among U.S. and Japanese cars (that is, a Lincoln differs from a Chevrolet and an Acura from a Subaru). This, too, significantly alters the results and in particular shows the auto-industry firms as behaving more competitively than Bertrand oligopolists; Dixit, by contrast, finds competition to be somewhere between Bertrand and Cournot, reaffirming the point he makes elsewhere that the auto industry is really quite competitive by the standards of national industrial organization studies.

[33] The conjectural variation is the rate of change of rivals' total output with respect to a firm's own output. Each firm tries to maximize profits, which for the ith firm are $f(\Sigma a_j)a_i - c_i(a_i)$, in which f is the industry's demand function, a_i is the ith firm's output and c_i is its cost function. The condition for profit maximization is:

$$f + (1 + v_i)a_i f' - c_i' = 0$$

in which the ith firm's conjectural variation v_i is assumed to be zero in a Cournot oligopoly, -1 in perfect competition, and $n - 1$ with symmetric collusion. When neither the assumption of Cournot behavior nor that of perfect competition seems appropriate, the conjectural-variations approach makes it possible to fit the data into the context of a simple one-shot game, without addressing the question of how equilibrium may be dynamically reached.

oligopolistic interaction, without imposing a specific form of interaction.

Baldwin and Krugman calibrate the model from the actual situation in the early 1980s. The model's simple structure minimizes the data requirements. The cost function is defined by a yield coefficient measuring the rate of increase in yield as cumulative output increases (this yield coefficient can be transformed into a more familiar learning coefficient to produce a downward-sloping average cost curve); this coefficient is technically determined and is the same for all firms. There are two markets, each with the same constant elasticity of demand, and the difference in revenue from selling in the foreign market rather than the home market is defined by a fixed-percentage transport cost. Values for the yield coefficient, the elasticity of demand, and transport costs are taken from the literature. The base-year market structure is approximated by six equal-cost U.S. firms and three equal-cost Japanese firms, and free entry is assumed (so that average cost is equal to price).[34] The conjectural variations (CVs), which produce the actual sales and prices, are now imposed; all Japanese firms are assumed to have the same CVs in the U.S. market and the same (but higher) CVs in their home market, while all U.S. firms have the same CVs in both markets. The asymmetry in the CVs arises because it cannot be assumed that the U.S. firms' CVs in the Japanese market actually determined the outcome; they may have been constrained by Japanese strategic trade policy. Assuming the same CVs in both markets implies a higher U.S. market share in Japan than U.S. firms actually had, and this is explained by an implicit tariff (equivalent to all the tariff and nontariff barriers faced by U.S. firms) of 26 percent. Thus, the size of the strategic trade barrier is determined by the calibration exercise, rather than by independent estimation.[35]

Baldwin and Krugman continue by comparing hypothetical situations of unrestricted U.S. access to the Japanese market (that is, removing the implicit tariff) and of a trade war in which the U.S. market is reserved for U.S. firms (represented by prohibitive tariffs in both markets). Baldwin and Krugman find that, with free trade, there would have been seven U.S. producers and no Japanese producers, compared to the "actual" six U.S. and three Japanese suppliers. They thus conclude that

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[34] There is an integer constraint, which means that (small) positive profits are possible. More importantly, the number of firms was in reality larger than the number assumed in the model, and their size was very uneven, although it is unclear what the implications of this market structure are.

[35] The actual Japanese and U.S. tariffs on semiconductors were around 11 percent and 9 percent; Baldwin and Krugman ignore U.S. protection.

Japanese trade policy did create comparative advantage. Without a protected home market, Japanese firms would have had lower output and higher marginal costs, which would have left them with losses and forced them to exit from all markets. The welfare effects of the Japanese policy are, however, negative for the United States, for Japan (whose consumers lose more than Japanese producers gain), and for the world (which has higher costs with nine chip producers than with seven). Retaliation by the United States would, however, reduce U.S. welfare still further, as protected U.S. firms would operate with smaller production runs and higher unit costs.

The Baldwin-Krugman results are what we would expect from this kind of model and fit in with the conclusions in earlier parts of this paper. As empirical work, however, they are rather fragile. The authors themselves suggest a series of theoretical and practical limitations of their analysis. First, the conjectural-variations approach is operationally useful but has little theoretical foundation. The specific form considered has U.S. firms assuming the same total response to a one-unit increase in their supply to both U.S. and Japanese markets; the more plausible case of a bigger response to an increase in supply to the foreign market would undermine the policy conclusions because it could help to explain the poorer performance of the U.S. firms in practice relative to the free-trade simulation.[36] Second, the model ignores the possibility of predatory selection of capacity level as a form of oligopolistic competition. Third, the possibility of externalities is also ignored, so that the conclusion that Japan lost out by its strategic trade policy in this sector will not convince proponents of such policies. In sum, Baldwin and Krugman's study assumes away some key issues. It suggests a plausible set of consequences from one type of strategic trade policy, but there is no way of knowing whether they capture what actually happened in the market for 16K RAMs.

The semiconductor industry has been a major proving ground for proponents of a U.S. strategic trade policy. The work of Borrus, Tyson, and Zysman (1986) is a good example of the anecdotal, case-study approach, which suggests some use of "strategic" policies by Japan, but their evidence is not conclusive. Moore (1990) has used quarterly data

[36] The CV values are also suspiciously high, much more collusive than Cournot behavior. This is necessary to explain why, with strong learning effects producing a downward-sloping cost curve, the industry has not become more concentrated. Within the model, the only explanation is a fairly high degree of collusion among the nine firms, but that sits uneasily with the free-entry assumption.

from 1970 to 1985 to test econometrically the hypothesis that the share price of three major U.S. semiconductor producers was negatively affected by Japanese R & D subsidies. Moore tries various specifications and lags, but he is never able to reject the null hypothesis of no impact. Although presenting a more rigorous test than previous descriptive work, Moore's results will not convince supporters of strategic policies, who will respond that the R & D subsidies were only a small part of the strategic-policy package. More generally, the problems of defining variables and of assembling a large enough sample have discouraged econometric testing of hypotheses about imperfect competition and international trade.

The market for wide-bodied jet aircraft is the other industry often quoted as an example of strategic trade policy.[37] The Boeing-Airbus duopoly is the central case in Dixit and Kyle (1985) and in Krugman (1987), but the former has simply a taxonomy of potential outcomes, whereas the latter is based on a hypothetical payoff matrix that has no claim to empirical relevance. Baldwin and Krugman (1988a) model the case as a Cournot duopoly and emphasize the procompetitive impact of having two producers rather than one: the United States, as the home of the incumbent monopolist, loses from the entry of Airbus; the net effects on the EC are close to zero;[38] and the rest of the world benefits from lower aircraft prices. Klepper's (1990) simulation study also adopts a Cournot duopoly model, but with stronger learning effects, so that Airbus entry is worse than a Boeing monopoly. Klepper concludes, however, that Airbus entry was preferable to keeping a U.S. duopoly of equal-sized producers; the second U.S. firm would be more efficient than Airbus (because McDonnell Douglas had already moved down its learning curve), but this benefit would be more than offset by the loss of Boeing's profits as smaller market share pushed Boeing back up its average cost curve. This result is obviously driven by the strong learning effects and simple assumptions about cost curves (the same for all firms)

[37] Baldwin and Flam (1989) have argued that Brazil used strategic trade policies in the market for 30 to 40 seater aircraft. Their results are subject to similar criticisms to those of the Baldwin-Krugman and Klepper calibrated models. Rent snatching seems less plausible in the 30 to 40 seater market than in the market for large civilian jets, because there were four producers and several smaller and larger planes were close substitutes for the 30 to 40 seaters. The opportunity for rent-snatching policies in the large-jet-aircraft market is considered in greater detail in Pomfret (1991b).

[38] Katz and Summers (1989a, p. 104) point out that allowing for labor rents in the aircraft industry could turn the Baldwin-Krugman estimate into a substantial net gain for Europe.

and the nature of oligopolistic reaction (essentially no strategic moves on the part of Boeing).[39]

All of these Boeing-Airbus simulations are stylized studies with hypothetical payoff matrices or market structures. A major problem is in identifying all subsidies (and other government support) for Airbus and Boeing and in accurately estimating the true returns to Airbus.[40] Moreover, the market for large jet aircraft is hardly a fixed duopoly. Baldwin and Krugman (1988a, p. 50) describe the experience of Lockheed and McDonnell Douglas, which both made losses on two close substitutes (the DC-10 and the L-1011) introduced in the early 1970s, and conclude that, without Airbus, "the manufacture of wide-bodied aircraft would be essentially a Boeing monopoly." This is incorrect, insofar as McDonnell-Douglas retained the capacity to make large aircraft and in fact launched the 300-seat MD-11 early in 1991, even in the face of two competing models (the A-340 and Boeing 777).[41] Finally, competition to provide any one model is part of a repeated game in the passenger-aircraft industry. In reality, there are likely to be many games taking place simultaneously as the European aircraft industry and its suppliers play against European governments, potential regions of production play against central governments (Acquitaine vs. Paris, for example), and labor unions play against management and governments.

The most studied imperfectly competitive industry is surely the

[39] Didier Laussel, in comments following Klepper's paper, questions whether aircraft makers really play Cournot; they appear to post prices and then collect orders. No study has seriously addressed the nature of capacity (Klepper justifies the Cournot assumption on Kreps-Scheinkman grounds) or pricing (actual prices are hidden in packages that include varying mixtures of extras).

[40] Airbus, as a groupement d'intérêt économique is not required to report its financial results, and it does not (*The Economist*, February 16, 1991, pp. 51-52). Stegemann (1989, p. 94) quotes a German report suggesting that the costs to Germany from supporting the Airbus project have not been justified, which is quite a different outcome to that incorporated in Krugman's payoff matrices. Boeing does, of course, publish financial data, but it is still difficult to estimate the cross-subsidies to its passenger aircraft production from military spending.

[41] Lockheed also is committed to maintaining commercial-aircraft production, in order to reduce its dependence on Pentagon contracts (74 percent of its revenue in the early 1990s), and it clearly has the ability to compete in any segment of the market (see story in *The Wall Street Journal*, March 19, 1991, p. A3). The theory of contestable markets implies that profits will be close to zero under these conditions, which contradicts the Baldwin-Krugman results and Krugman's hypothetical payoff matrix, which both assume large monopoly profits.

automobile industry.[42] There are simulation studies of the industry similar to the ones described above (for example, Dixit, 1988b, on the United States; Laussel, Montet, and Pequin-Feissolle, 1988, on Europe), but there are also many case studies using alternative methods.[43] The overwhelming conclusion is that the VERs negotiated with Japan by North American and European importing countries led to large welfare losses for the importing countries and created little domestic employment, although the profits of domestic and Japanese firms were increased substantially. These effects were most pronounced in the United States in the first half of the 1980s, because there was no trade diversion. In the EC, other EC members' car industries benefited from the Italian and French restrictions and helped to keep down the loss of consumer surplus; in Canada, South Korean imports played a similar role. The car industry is the prime example of VERs operating as a facilitating practice, allowing domestic and foreign firms to maximize their joint profits at the expense of consumers in the home country.[44] The policy is porous, however, for new entrants may be encouraged, consumers may turn to substitutes (for example, small trucks in North America after VERs on cars were introduced), or other unexpected consequences may arise (such as local governments encouraging construction of Japanese transplant factories).

Smith and Venables (1988) and Venables and Smith (1986) have

[42] Steel is another industry in which controversial trade policies have been common in recent decades. Although the largest steel producers have a substantial share of the domestic market, there is a significant competitive fringe of minimills in both the United States and the European Community. International markets are even more competitive. It seems unlikely that any of the models of imperfect competition discussed in this paper are applicable; even the numerous VERs negotiated by the United States and the EC with supplying countries are analyzed better in a competitive framework than as practices facilitating the exercise of domestic-market power (Pomfret, 1989a).

[43] This literature is too extensive to survey here. On the U.S.-Japanese VERs, important initial studies by Crandall (1984) and Feenstra (1984) established the large welfare costs and transfers and the role of quality upgrading, whereas later work by McKinney and Rowley (1986), Mannering and Winston (1987), and Collyns and Dunaway (1987) incorporated imperfect competition and found that domestic output either fell or did not rise in response to the trade restriction. De Melo and Messerlin (1988) and Smith (1990) review the European cases, and Hindley (1985) makes a more detailed estimate of the U.K. loss from VERs. The Canadian case is debated between Hazledine and Wigington (1987) and Dunnett (1989) and is also dealt with in Pomfret (1989b).

[44] Other less-studied examples are the 1983 VER on Japanese video cassette recorders sold to the European Community (Hindley, 1986) and the 1986 U.S.-Japan Semiconductor Arrangement, which was followed by a near doubling in the price of 256K chips in the U.S. market within eighteen months.

applied an imperfect-competition model to calculate the effects of completing the EC's internal market. In a partial-equilibrium framework, they apply a differentiated-product model to ten Standard Industrial Trade Classification (SITC) 3-digit industries, dividing the world into six markets (France, Germany, Italy, the United Kingdom, the rest of the EC, and the rest of the world). They find that their results are fairly insensitive to model variations (for example, replacing Cournot behavior by Bertrand or allowing firms to change the number of varieties they produce). Reducing intra-EC trade barriers does increase welfare, but removal of market segmentation has a much larger welfare effect; under present conditions, unrealized scale economies are less harmful than the exercise of monopoly power in segmented markets.

General-Equilibrium Studies

Several studies have incorporated imperfectly competitive industries into CGE models of the whole economy. The most celebrated of these (Harris and Cox, 1984) predicts substantially greater gains from Canadian trade liberalization when imperfectly competitive industries are assumed than when industries are perfectly competitive. The Harris-Cox results strengthen the case for free trade, at least in terms of an across-the-board criterion for Canadian trade policy. This is especially true if it is negotiated bilaterally with the United States or multilaterally so that the benefits from increased access to foreign markets add to the gains from removing Canada's own trade barriers.

The Harris-Cox model has been criticized for the nature of its behavioral assumptions.[45] Firms either collude in setting a "focal price" equal to the world price plus tariff (which is closely related to the Eastman and Stykolt view of the consequences of Canadian trade barriers), or monopolistically competitive firms set price as a markup over marginal cost (with the size of the markup depending upon the firm's perceived market power). Harris and Cox assume for their calculations that the actual price charged is a weighted average of the focal price and the monopolistic-competition price. This makes little economic sense, and other studies that have rerun the CGE model assuming either focal or monopolistic-competition pricing come up with much smaller gains from free trade.[46]

[45] Markusen (1985, pp. 138-141) lists some other reservations, in particular, the absence of any specific factors reduces the cost of removing trade barriers.

[46] Harris and Cox estimate a net welfare gain from trade liberalization (from a 1976 base) equal to about 9 percent of Canadian GDP. The Canadian Department of Finance

Brown and Stern (1987, 1989a, 1989b) have applied the Michigan CGE model to the U.S.-Canada free-trade agreement. They also find that the estimated welfare gains to Canada are larger when imperfect competition is assumed, although the numerical magnitudes are much smaller than the Harris-Cox results. Their 1987 paper assumes perfectly competitive markets and product differentiation by nationality (the Armington assumption); this assumption produces strong terms-of-trade effects when Canadian and U.S. tariffs are eliminated bilaterally, while offering little scope for efficiency gains through rationalization, and Canada suffers a welfare loss (primarily because Canada starts with higher tariffs). Brown and Stern (1989a) run the model with three different market assumptions: the Armington perfect-competition assumption, a Harris-Cox monopolistic-competition assumption, and a Venables-Smith market-segmentation assumption. Moving from product differentiation at the national level to product differentiation at the firm level substantially reduces the terms-of-trade effects, and, with the second assumption, Canada enjoys a net welfare gain from bilateral trade liberalization equal to 1.2 percent of GDP. The market-segmentation model produces results similar to those with the first assumption. Brown and Stern (1989b) repeat the exercise adopting their best guess of the appropriate market structure for each industry and estimate a small terms-of-trade loss offset by efficiency gains for a net Canadian welfare increase equal to 1.1 percent of GDP. The implication of these exercises is that imperfect competition increases the potential gains from trade liberalization, but any estimate of the magnitude of these gains is very sensitive to the assumed nature of imperfect competition.[47]

(1988) ran a modified version of the Harris-Cox model and came up with an estimated welfare gain equal to 2.5 percent of GDP. Wigle (1988) estimates a small net welfare loss (equal to -0.1 percent of GDP). Wigle not only adopts an either/or approach to the pricing rule but also uses a different calibration procedure and pays more attention to modeling the rest of the world, so it is difficult to make a simple comparison of why the results differ.

[47] Hazledine (1990) has developed an "encompassing model" to show that Harris-type assumptions (imperfect competition plus free entry and unexploited scale economies) produce much higher estimates of the gains from Canadian trade liberalization than do other assumptions. Gunasekera and Tyers (1991) apply a Harris-type model to South Korea and also find significant welfare gains (equal to about 7 percent of GDP) from longer production runs if less distortionary policies have been adopted. They warn that their results may be sensitive to behavioral assumptions and parameter values, but it is difficult to assess this caveat.

Where is the Rent?

None of the more recent studies gives any reason to doubt the earlier quoted conclusion by Dixit (1986; see Chapter 4 above), that the opportunities for profit snatching appear to be empirically insignificant. In calibrated models, profits have usually been assumed away by allowing free entry, in order to be able to derive costs from a condition in which price equals average costs. Even in case studies, however, there is no evidence of substantial above-normal profits that can be snatched by strategic policies. Katz and Summers (1989b, p. 214) have calculated after-tax profit rates for twenty 2-digit U.S. industries and conclude that the 1960 to 1985 average of 6 percent is "close to plausible estimates of the cost of capital." There may be a problem of using accounting rather than economic profits in such an exercise, so Katz and Summers replicate their result using Tobin's q (measured by equity plus debt divided by the inflation-adjusted capital stock). The 1960 to 1985 average value of q is 1.28 and q falls even below 1 in the first half of the 1980s, implying that fixed assets are sufficient to account for the entire capitalized value of firms and leaving little or no room for rents to shareholders. Katz and Summers then quote work by Hoshi, Kashyap, and Scharfstein (1991, p. 42), who estimated an average q close to 1 for a large sample of Japanese firms. Katz and Summers (p. 269) conclude that shareholders "receive only very small monopoly rents" and "the potential gains from shifting them are minor."

Recent rent-based arguments for strategic trade policies have focused on the possibility of rents accruing to labor rather than to shareholders. The starting point is the well-established existence of significant unexplained wage differentials between industries. These patterns have been stable at least through the twentieth century and appear to be similar across countries. Moreover, high-wage industries have lower quit rates than low-wage industries, suggesting that workers in the former believe their wages exceed their opportunity costs (that is, they receive rents).[48] Given that labor accounts for a much larger share of value added than capital does (87 percent versus 13 percent in the Katz-Summers sample), the opportunity for large rents being hidden in labor remuneration is much greater than for their being included in owners' profits.

[48] All of these stylized facts appear to be generally accepted among labor economists; Thaler (1989) provides a guided tour of the literature.

If firms are on their labor-demand curves, pricing labor at the value of its marginal product, labor will be more productive at the margin in high-wage industries, and there will be gains from reallocating labor from low-wage to high-wage industries. One way to realize such gains is to protect the high-wage activities, encouraging increased output by these industries. This is an old argument, going back *inter alia* to Hagen's (1958) argument for protecting manufacturing in developing countries, because agriculture pays a lower wage. A superior way of realizing the gains, however, would be an employment subsidy to the high-wage industry (Bhagwati and Ramaswami, 1963). There is a narrow dividing line between employment subsidies and trade policies, however, if, for example, the high-wage industry is an exporter. Katz and Summers (1989a) argue that export subsidies will increase U.S. national welfare because export industries tend to be in the high-wage group and that, even if other countries retaliate with their own export subsidies, global welfare may be raised because more resources will have been directed into high-wage activities.[49] Dickens and Lang (1988) propose an even more activist policy of targeting high-wage industries (and retaliating against other countries' attempts to expand such industries by subsidies).

The wage-differentials argument can be used to justify strategic trade policy, but it is scarcely original. Economists have long known that, for any domestic distortion, a trade policy may be welfare-improving, but it is not the first-best policy. Factor-market distortions, in particular, have been thoroughly analyzed (for example, by Magee, 1976).

Dixit (1988b) introduced rents to labor into his calibrated model of the U.S. auto industry. This substantially increases the likelihood of national-welfare gains from trade barriers. Katz and Summers (1989b, pp. 256-258) point out that this would be true of other calibrated models. There has been, however, no factual study showing a strategic trade policy leading to increased labor rents as part of an improvement in national welfare.

The worrying point about using observed wage differentials as the justification for strategic trade policies is that we do not have a con-

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[49] In his comments following Katz and Summers' paper, Froot points out that their case rests on a small-country assumption of fixed world prices, an assumption that may not be appropriate to the United States. Without that assumption, he suggests, terms-of-trade effects can easily wipe out the welfare gains. If, in addition, the foreign response is a countervailing duty, the export subsidy will not generate added output in the high-wage industry but will simply lead to a welfare transfer from the subsidizing country to the countervailing country.

vincing explanation of the differentials.[50] As Thaler (1989) emphasizes, their existence is an anomaly, explicable only in terms of some form of the efficiency-wage hypothesis (that is, lowering wages would reduce profits in the high-wage industries) or by behavior that is not profit maximizing. The two explanations are not mutually exclusive; managers may use the benefits of market power to gain higher salaries and wages rather than profits, and, at the same time, considerations of fairness may make wage differentials rational. Indirect support for the first hypothesis is provided by another anomaly: large firms pay higher wages than small firms and quit rates are negatively (and average years of tenure positively) correlated with firm size (Brown and Medoff, 1989). This suggests the possibility that firms with greater market power share their rents among employees, although Brown and Medoff find no direct link between market power and the size-wage relationship.[51] Further suggestive evidence is Magee, Brock, and Young's (1989, pp. 105-109) finding that trade associations and labor unions from an industry almost always have a common position on U.S. trade policy, in contrast to the prediction of the Stolper-Samuelson theorem. If management and union leaders succeed in winning rents, considerations of fairness may require that these be shared with all categories of workers in order to avoid discontent in the ranks.[52]

In sum, the monopoly rents available for snatching by strategic trade policies are not substantial, and, if they exist to any significant degree, they seem to accrue to labor rather than to profit earners. The averages referred to above may hide pockets of high-rent activity, but, where high rents have turned up in case studies, they are generated by trade policies rather than preexisting the trade policies. For the U.S. auto industry, the 1981 VER on Japanese imports maintained the domestic industry's wage differential and led to huge and highly publicized bonuses for top management, almost certainly with a negative net welfare effect on the United States.

[50] There is also a lingering doubt as to whether inter-industry wage differentials, holding all other productivity determinants constant, really do exist. Topel, in his comments following Katz and Summers (1989b), claims that the phenomenon reflects dimensions of productivity unobservable to econometricians, and that it is in any case inappropriate to base a policy recommendation on an unexplained residual.

[51] They are unable to explain size-wage differentials when observable labor-quality indicators are held constant and conclude that "the employer size-wage effect remains a fact in need of an empirically based theory" (p. 1057).

[52] Kahneman, Knetsch, and Thaler (1986) provide evidence of common perceptions of "fair" behavior in such situations.

A study by Kalt (1988) on the 1986 U.S.-Canada softwood lumber dispute illustrates some similar points about U.S. "strategic" trade policy in practice. The U.S. complaint was ostensibly about subsidies to the Canadian lumber industry from low stumpage fees, but stumpage fees essentially distribute the rent from timber on public lands to the government and the lumber producers, rather than provide a subsidy. The U.S. implementation of a 15-percent countervailing duty on Canadian lumber was a method of taking advantage of U.S. market power to snatch a share of the (in this case, natural-resource) rents. When the Canadian government threatened retaliation, a negotiated solution was found whereby Canada imposed a 15-percent export tax. Table 1 summarizes the welfare effects of the two measures. The picture is of a U.S. policy pushed by powerful domestic interests who care little whether the increase in producers' rent is part of a national net welfare gain or loss. The Canadian producers and owners of resources were better off with the export tax, because they had a larger rent to share out. The losers were the U.S. consumers, who may not have been aware how much the dispute cost them (an estimated $1,000 added to new-house prices) but were anyway too dispersed to organize resistance to powerful senators and representatives from the lumber-producing states.

TABLE 1

ANNUAL WELFARE EFFECTS OF SOFTWOOD LUMBER MEASURES

(*in millions of 1986 U.S. dollars*)

	With 15% U.S. Duty	With 15% Canadian Export Tax
U.S. Lumber Producers	+416.8	+416.8
U.S. Lumber Users	−556.9	−556.9
U.S. Government	+340.5	0
Net U.S. Welfare	+200.4	−140.1
Net Canadian Welfare	−223.0	+117.6

SOURCE: Kalt (1988), pp. 354 and 359.

8   CONCLUSIONS

The conclusions drawn from the new trade theories can be grouped under three headings. First, the presence of imperfect competition affects the positive conclusions about the consequences of international trade and of trade policies. Second, and this is the aspect of the new trade theories that has received the most publicity, there are normative implications for what is the desirable trade policy. Third, imperfect competition may affect the political economy of trade policy, that is, the forces determining which trade policies are actually implemented.

Positive Economics

Scale economies have long been accepted as a reason for international trade, although they are not emphasized in traditional trade theory. If trade is due only to scale economies, the pattern of trade is indeterminate and there may be multiple equilibria (so that it may be unclear where the gains from trade will accrue). It is also self-evident that the benefits of international specialization are increased in the presence of scale economies. The new trade theories essentially reinforce these conclusions. With monopolistic competition, there is a further gain from trade in the form of an increased number of varieties available to domestic consumers, but the pattern of trade (that is, which country produces which varieties) remains indeterminate in the absence of more specific assumptions.

The main innovation of the new trade theories is that they analyze strategic interaction among private firms. Previously, there had been analysis of strategic interaction only among governments (for example, the Scitovsky-Johnson analysis of optimal tariffs and retaliation). Without government intervention, introducing strategic interaction among firms simply means applying oligopoly theory to international rather than to national markets. The possibility of segmenting markets by VERs or other trade policies, however, adds a novel dimension. These government policies may facilitate collusion, which will allow firms to increase their joint profits and reduce global welfare by moving closer to a monopoly outcome, but the distribution of changes in national welfare is less certain.

Normative Economics

Traditional trade theory concludes that, under certain conditions, including perfect competition, free trade maximizes world welfare. If a country enjoys some monopoly power in world markets, its government can increase national welfare by restricting trade in order to improve its terms of trade. Such a policy will be confrontational because any benefits to the country will be at the expense of its trading partners. Those partners will probably retaliate, which will further reduce world welfare and probably also reduce the national welfare of the country initiating the trade war. Although there is a long list of domestic distortions in the presence of which international trade policy can increase national welfare, the traditional conclusion is that trade policies will never be the first-best method. The best rule of thumb is to allow free trade (preferably by multilateral agreement) to rule out opportunistic use of trade barriers to improve terms of trade.

Imperfect competition introduces two novel arguments in favor of trade restrictions. In industries with a small number of firms and restricted entry, monopoly rents can exist, and trade taxes or subsidies may allow a country to grab a bigger share of these rents. This is a logical argument in favor of trade restrictions as an optimal policy even for a small country and is thus of some theoretical importance. In practice, however, there are great difficulties in determining the correct policy for snatching rents. By mistaking the nature of oligopolistic interaction (or inter-sectoral linkages or other general-equilibrium effects), the government may get the policy diametrically wrong (for example, impose an export subsidy when an export tax is required). Moreover, the empirical evidence suggests that the rents available for potential snatching are modest.[53] Thus, the potential gains from the optimal trade policy are not large, and chances of implementing a costly mistaken policy are significant. Finally, even if the best policy is implemented, other governments are likely to retaliate, leading to a decline in both global and national welfare.

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[53] The only numerical evidence of rent snatching is in the stylized Boeing-Airbus case of Krugman (1987), Katz and Summers (1989a, p. 104), and Klepper (1990), but none of these models convincingly captures the actual aircraft industry. Allowing for more competitive behavior than Cournot or for more producers than two could easily reverse the alleged net welfare gain to Europe from subsidizing Airbus.

The second argument arises from the disparity between price and marginal cost in unregulated industries with scale economies. Trade policy can be used to bring price closer to marginal cost, improving global and national-resource allocation, but it is not the first-best policy. The best solution would be to have a global antitrust policy, but this is impractical. Even at the national level, other policies are superior to trade policies. De Meza's argument that a price ceiling will usually be the best solution to the gap between price and marginal cost is robust for oligopolies. There are implementation problems with all of these policies, however, because the optimal policy requires a knowledge of the firms' cost curves, which only the firms have—and they have an incentive to misstate the true costs.[54]

In monopolistically competitive industries, there are no rents. Because firms produce to the left of the minimum point on their average cost curves, however, there are potential national benefits from increasing the output of domestically produced varieties. The argument in favor of a tariff to switch demand from imported to domestic varieties is logically valid—if the actions of other governments are ignored. As each government operating in isolation imposes tariffs on imported varieties, world welfare is reduced, and everybody is worse off. To escape this prisoners' dilemma, the optimal policy is multilaterally agreed upon free trade.

In sum, the normative implications of the new trade theories are extremely limited. As Bhagwati (1989), Corden (1990), and Haberler (1989) have emphasized, the results just add more theoretical exceptions to the free-trade rule, exceptions, however, that have very dubious practical value.[55] As a general rule for trade policymakers, the case for free trade is enhanced rather than diminished by the introduction of scale economies and imperfect competition into the analysis.[56] In some

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[54] The implementation difficulties recall an earlier quip by Harry Johnson that second-best policies that were not implemented by first-best economists could turn out to be third or fourth best. Or, as Shakespeare put it: "If to do were as easy as to know what were good to do, chapels had been churches, and poor men's cottages princes' palaces. . . . I can easier teach twenty what were good to be done, than be one of the twenty to follow mine own teaching" *The Merchant of Venice*, quoted by Richardson (1986, p. 274).

[55] This sentence paraphrases Haberler's penultimate paragraph. Corden (1974, pp. 412-414) concludes his 1974 book with ten circumstances in which trade interventions might be first best; his new edition might list an eleventh.

[56] Grossman (1986) was an early and powerful critic of using the new trade theories to support interventionist trade policies. Krugman (1987), in a much-cited article with a provocative title, argues that international trade theory no longer supports the case for free trade, although free trade may be the best policy for reasons of political economy (described in the next subsection). Bhagwati (1989) offers a rejoinder, emphasizing that,

imperfectly competitive situations, however, governments have an incentive to introduce interventionist trade policies if these policies operate unilaterally. The conclusion remains, therefore, that multi-laterally agreed upon free trade is the optimal policy.[57]

Political Economy

The new trade theories often reinforce the case for free trade, yet part of their popularity derives from their association with interventionist, "strategic" trade policy. The simple explanation for this paradox is that any argument in support of import barriers or export subsidies finds a ready market, because these measures invariably benefit some domestic producers. Even if the benefits are outweighed by losses to other groups (domestic consumers or taxpayers), the beneficiaries usually enjoy concentrated gains, whereas the losses are spread over a large number of groups and individuals. In addition, the beneficiaries may already have well-organized lobbies.

A more sophisticated answer draws on the common confusion between increased national output and increased national welfare and between partial- and general-equilibrium effects. If a policy can be shown to increase national output of a good, it is often assumed by policymakers and popular commentators to be desirable. Thus, if subsidies make the European Airbus commercially viable, these subsidies are assumed to be good for Europe. Or, if guaranteeing the home market enables Japanese chip-makers to gain a larger share of the world market, this guarantee is assumed to be good for Japan. These are obvious *non sequiturs*, yet they have a strong popular hold. The Baldwin-Krugman chip-simulation study gives a range of parameters for which trade policy accounts for increased Japanese market share and lower Japanese welfare, and for which U.S. retaliation could increase the number of U.S. chip producers but reduce U.S. national welfare. It is also plausible that the large European subsidies for Airbus have been welfare-reducing for the participating countries.

The subsidies used to make the Concorde a commercial white elephant are a more spectacular example of unsuccessful targeting (Henderson, 1977), and the U.S. Congress was surely right to cut

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on balance, the theoretical developments strengthen the case for free trade and that it is unnecessary to evoke pragmatic reasons of political economy to justify free-trade policies.

[57] It is thus especially ironic when the new theories are quoted in support of strategic trade policies explicitly designed to break the rules of the General Agreement on Tariffs and Trade (GATT).

American losses in 1971 by scrapping aid to the U.S. supersonic-transport program. Borins and Brown (1986) document some disastrous Canadian attempts to pick winners, several of which were driven by the desires of provincial governments to promote activity within their provinces. The profitability of the projects was seldom scrutinized effectively, and they were poorly monitored, so that, even when the losses were mounting, the authorities did not cut off support soon enough to save billions of taxpayer dollars.[58] The new trade theories show that, in many situations of imperfect competition, import barriers or export subsidies can increase world market share to an even greater extent than in competitive industries, so that this confusion between output and welfare effects is likely to be especially common in imperfectly competitive activities.[59]

In imperfect competition, some trade barriers have exceptionally negative net welfare effects, which may be because both gains and losses are larger than under perfect competition. The replacement of tariffs by quotas in the presence of a domestic monopoly is an example. In such situations, the beneficiaries have even stronger reasons for seeking the desired trade policy than under perfect competition. By definition, moreover, producers in a concentrated industry are likely to find it easier to lobby effectively and to avoid the problem of free riders. Where trade barriers allow domestic and foreign oligopolistic firms to move closer to the point where joint profits are maximized, an important counterbalance to domestic lobbying for protection is absent; because the foreign firms also benefit from the trade barrier, they will urge their own governments to cooperate rather than to retaliate (as in the U.S.-Japan auto VERs).

[58] Among the projects analyzed by Borins and Brown are a sports car, interactive computer terminals, and an executive jet aircraft—all innovative products apparently suited to strategic policy. Borins and Brown believe some of the projects had the potential to succeed, but dependence on public help was corrosive and control over public spending was incompetent: "Public servants monitoring the companies lacked expertise and often were co-opted into becoming company advocates" (p. 147).

[59] An additional element is that many imperfectly competitive industries are believed to be inherently desirable because they are high-tech and have significant externalities. This is difficult to refute, but there is not much hard evidence in support. The situation is reminiscent of the ubiquitous tendency of developing countries to promote domestic steel industries during the 1950s and 1960s (supported by appeals to the infant-industry argument and to linkage effects) and to despise Taiwan and Hong Kong for trying to develop on the basis of a comparative advantage in low-tech products like clothing, artificial flowers, and wigs.

As well as being larger, the welfare effects of trade barriers may be more complex and unpredictable with imperfect competition. Outcomes are more difficult to predict when policy changes work through shifts in firms' reaction functions, and behavior or motives of the limited number of actors may change (Pomfret, 1987). This is a variant on Krueger's (1990) "life of its own" theory of protection; participants in the political process look to short-term utility maximization, but the dynamics of complex trade barriers produce long-run consequences that lead to new demands for changes in trade policy. These unforeseen consequences are seldom beneficial, given the presumption that noninterventionist trade policies will usually maximize global output.

Reflections

Giving imperfect competition greater prominence in international trade theory often reinforces the case for free trade as the best trade policy and, in particular, strengthens the case for multilaterally agreed upon free trade. It also emphasizes the possibility that important domestic interests will favor interventionist trade policies, especially export subsidies or import restrictions by their own government or export restrictions by foreign governments. This may even be true when the policies are against the national interest; in some cases, foreign firms will be accomplices by forestalling retaliation. In the world of second best, almost anything can happen, but, in the second-best situation of international trade under imperfect competition, plausible generalizations are not so strange; they are the results of traditional trade theory writ large.

One emerging lesson of this conclusion is that the theory of the second-best is no reason for economists to abandon the search for sensible policy recommendations. Most economic-policy issues arise in second-best settings where absolute generalizations are unattainable and paradoxes are possible, but empirical study can reveal which generalizations are practically useful and which paradoxes can be ignored by policymakers as curiosa. The theory of discriminatory trading arrangements (in which the Lancaster-Lipsey theory of the second-best was born) provides a strong case, supported by empirical work and by history, that piecemeal preferential trading arrangements are harmful to global economic welfare and often ultimately hurtful to the short-run beneficiaries (Pomfret, 1988). This is a useful policy conclusion.

My reading of the literature on international trade with imperfect competition suggests the emergence of the parallel conclusion that, although strategic trade policies may yield short-run benefits in particular

situations, these situations appear to be rare in practice. In addition, the proliferation of strategic trade policies will almost certainly reduce global welfare and the individual economic welfare of all trading nations. This reading, however, still awaits confirmation by further empirical work on how such policies have functioned in practice.[60] Edgeworth's (1925) criticism of the applicability of Bickerdike's infant-industry argument to actual trade policy is equally applicable to strategic trade policy:

> Thus the direct use of the theory is likely to be small. But it is to be feared that its abuse will be considerable. It affords to unscrupulous advocates of vulgar Protection a peculiarly specious pretext for introducing the thin end of the fiscal wedge. Mr. Bickerdike may be compared to a scientist, who by a new analysis has discovered that strychnine may be administered in small doses with prospect of advantage in one or two more cases than was previously known; the result of this discovery may be to render the drug more easily procurable by those whose intention, or at least whose practice, is not medicinal. . . . Let us admire the skill of the analyst, but label the subject of his investigation POISON.

[60] Thorough empirical work is difficult in concentrated industries, especially when policy proposals or opaque trade barriers are being analyzed. Nevertheless, it is worrying to see the extent to which Baldwin and Krugman's chips and aircraft papers are taken as empirical work, rather than as illustrative studies (as the authors present them). Even *The Economist*, in its down-to-earth "World Trade Survey" (September 22, 1990, p. 20), refers to these two studies as "the real-life versions, as opposed to the let-us-imagine versions." They *may* capture the essence of these two markets, but, given the simplifying assumptions about market structure, the behavior of the firm, and the derivation of the strategic trade barrier from the model, they require further corroboration before being accepted as true pictures.

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