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## Strategic Trade Policy and Welfare: The Empirical Consequences of Foreign Ownership

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STRATEGIC TRADE POLICY AND WELFARE:  
THE EMPIRICAL CONSEQUENCES  
OF FOREIGN OWNERSHIP

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**Strategic Trade Policy and Welfare:  
The Empirical Consequences of Foreign Ownership**

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## **Abstract**

A common assumption in strategic trade models is that a firm's assets are owned exclusively by that country's residents, implying that trade policy objectives of domestic firms and domestic investors coincide. With international cross-ownership of assets, however, these interests will tend to diverge. This paper investigates the empirical importance of foreign ownership for strategic trade policy models' welfare conclusions. Two results are noteworthy. First, if firms behave cooperatively within each nation and non-cooperatively between nations, existing levels of international equity cross-ownership reduce the average optimal export subsidy by 61% relative to the Brander and Spencer (1985) value for U.S. manufacturing industries. Second, the subsidy-dampening effect of foreign ownership is greatest in precisely those industries whose cost or market characteristics might otherwise make strategic trade policies appear attractive. The paper's findings indicate the empirical importance of linking firms' foreign trade and investment decisions in models of trade policy.

## I. Introduction

The strategic trade policy literature has illustrated how classical theory's welfare conclusions may be weakened or reversed under imperfect competition. Recent theoretical extensions of early strategic trade models, however, have identified reasons for caution in welfare analysis. Eaton and Grossman (1986) have noted that optimal trade taxes and subsidies depend critically upon the assumed nature of competition among firms. Dixit and Grossman (1986) have shown how the presence of inelastically supplied inputs can cause trade intervention in one sector to have offsetting welfare effects in non-protected sectors. Dixit (1984) has demonstrated how welfare results derived under duopoly assumptions can quickly be reversed as the number of domestic suppliers increases. Carmichael (1987) and Gruenspecht (1988) have shown that optimal strategic trade policies and welfare conclusions are sensitive to timing and pre-commitment assumptions regarding government and firm actions. Finally, numerous writers have identified the complications of rent-seeking and potential foreign retaliation.

While this recent literature has provided ample theoretical illustration of the potential sensitivity of strategic trade policy models' welfare conclusions to their economic assumptions, to date there appears to have been no complementary *empirical* effort to gauge the plausibility of possible welfare outcomes or, alternatively, to indicate how important quantitatively these theoretical caveats may be in practice.<sup>1</sup> This paper attempts to respond to this shortcoming by illustrating empirically the sensitivity of welfare analysis to modifying a common assumption in strategic trade policy models: the absence of international cross-ownership of assets. Most models assume, either explicitly or implicitly, that domestic residents hold claims only against domestic firms' profits and, symmetrically, that foreign firms are wholly owned by foreign residents.

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<sup>1</sup> I distinguish between empirical studies and the large body of evidence from numerical simulation models that are "calibrated" to industry data. Richardson (1989) provides a comprehensive survey of these calibration studies' welfare predictions. Carmichael (1987) provides some descriptive evidence for Export-Import Bank subsidies consistent with his theory.

Three recent exceptions, Brander and Spencer (1987), Levinsohn (1989) and Lee (1990), illustrate clearly the potential consequences of relaxing this assumption. Brander and Spencer extend the earlier tariff-jumping literature on foreign direct investment (Horst (1971), Caves (1982)) by modeling strategic interactions between the host government and a multinational firm. They show that in the presence of local unemployment, the host government can credibly threaten higher import tariffs than taxes on local production, thereby inducing direct investment by the multinational. Levinsohn (1989) illustrates the general non-equivalence of tariffs and quotas when firms can invest abroad. Finally, Lee (1990) extends earlier work by Bhagwati and Brecher (1980) and Brecher and Bhagwati (1981) to provide a formal illustration of an intuitive result: optimal export subsidies and optimal import tariffs are both lower when some firm assets are foreign-owned.<sup>2</sup>

Each of these papers leaves unanswered an important empirical question: quantitatively, is foreign ownership an important caveat to strategic trade policy analysis? This paper offers a relatively simple empirical complement to this recent theoretical work by investigating the extent to which earlier strategic trade models' welfare conclusions are altered when existing levels of international cross-ownership of assets are taken into account. The paper's findings complement and provide empirical foundation for what has emerged as a general consensus among contributors to the strategic trade policy literature, namely, that the probable welfare gains from strategic trade intervention have been significantly overstated in many models.

The paper presents two simple empirical findings. First, extending Brander and Spencer's (1985) original model of duopoly competition, I show in Section II that strategic trade policy welfare conclusions can be weakened acutely when existing levels of direct foreign ownership and portfolio cross-holdings are taken into account. For the United States manufacturing sector as a whole, if firms behave cooperatively within each nation and non-cooperatively between nations,

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<sup>2</sup> On this topic, see also the May 1983 volume of the *Journal of International Economics*, and in particular Brecher and Findlay (1983).

the optimal export subsidy falls by 61% relative to its investment autarky value. In no industry does the welfare-maximizing export subsidy in the presence of international cross-ownership of equity exceed 52% of its investment autarky value, and in at least one industry an export tax becomes optimal.

Second, Section III indicates that foreign ownership rates tend to be higher — and thus the empirical importance of the foreign ownership caveat tends to be greater — in precisely those industries whose cost or market characteristics might otherwise make strategic trade policies appear attractive on welfare grounds. I document that direct foreign ownership shares are highest in industries with the highest R&D intensity, smallest inter-firm technology spillovers, steepest learning curves, strongest economies of scale, greatest product differentiation, highest industry concentration and highest barriers to entry.

Finally, Section IV concludes by indicating the importance of the paper's findings for developing economies, and by suggesting a strategic explanation for observed foreign investment patterns across industries.

## **II. Integrating International Cross-Ownership and Strategic Trade Policy**

As noted in the Introduction, with a few recent notable exceptions, a universal (implicit or explicit) assumption in strategic trade policy modeling is that domestic residents hold financial claims only against firms operating domestically and, symmetrically, that foreign-based firms are wholly owned by foreign residents. This simplifying assumption permits a one-to-one correspondence to be drawn between domestically-based firms' profits and the value of financial claims held by domestic residents. By implication, therefore, the trade policy objectives of these two groups (ignoring consumption effects) also will be perfectly aligned.

Casual observation indicates that this assumption is not supported empirically. Based on 1987 trade data, for example, \$167 billion or approximately one-third of total U.S. merchandise imports were manufactured by foreign-based affiliates of U.S. corporations. In the same year, \$48 billion or approximately one-fifth of total U.S. merchandise exports were manufactured by foreign-

owned affiliates operating in the United States.<sup>3</sup> Export and import policies affecting these firms' profits will not have the straightforward distributional welfare effects predicted by standard strategic trade policy models. The issue of integrating international cross-ownership into existing strategic trade policy models also is much broader than might initially be thought. In addition to considering the impact of foreign direct investment stakes on strategic trade policies, consideration must also be given to the impact of international portfolio investments, foreign licensing and royalty payments that depend on firms' sales or profit positions, and international research and production joint ventures.

This section re-evaluates welfare conclusions from a simple strategic trade policy model when current levels of cross-ownership are incorporated. It extends the original model of strategic export policy due to Brander and Spencer (1985) to allow for foreign direct investment and international portfolio holdings, and then calculates the impact of cross-ownership on optimal export subsidies by industry.

Following Brander and Spencer (1985), consider a simplified strategic setting in which two firms (home and foreign) export a homogeneous product to a third country market.<sup>4</sup> Firms behave as Cournot-Nash competitors, and governments are assumed to be able to set credible export taxes or subsidies in advance of firms' quantity decisions. Let  $y$  be the home firm's output and let  $y^*$  denote foreign output. Firms face an inverse world demand function given by  $p(y+y^*)$ , with  $p' < 0$ , and have a common cost function  $c(\cdot)$ . Let  $e$  denote the per unit subsidy to the home firm's exports. Given the symmetry of the results to follow, without loss of generality I assume no foreign subsidization (or taxation) of exports.

The home firm maximizes its profits  $\pi$ ,

$$(1) \quad \pi(y, y^*; e) = yp(y+y^*) - c(y) + ey,$$

<sup>3</sup> *Survey of Current Business*, January 1990, p. 35 and Norman (1990).

<sup>4</sup> Brander and Spencer (1985) subsequently allow for domestic consumption. I abstract from this complication here. For further discussion on the impact of domestic consumption on optimal trade taxes and subsidies, see Eaton and Grossman (1986).



and the foreign firm maximizes  $\pi^*$ , given by

$$(2) \quad \pi^*(y, y^*; e) = y^*p(y+y^*) - c(y^*).$$

The first-order conditions corresponding to (1) and (2) are, respectively,

$$(3) \quad \pi_y = 0 = p + yp' - c_y + e, \text{ and}$$

$$(4) \quad \pi^*_{y^*} = 0 = p + y^*p' - c_{y^*},$$

where a subscript denotes a derivative. Second-order conditions are given by

$$(5) \quad \pi_{yy} = 2p' + yp'' - c_{yy} < 0, \text{ and}$$

$$(6) \quad \pi^*_{y^*y^*} = 2p' + y^*p'' - c_{y^*y^*} < 0.$$

Following Brander and Spencer (1985), I assume that the Cournot–Nash equilibrium defined by (3) and (4) is stable and unique, which can be assured by the condition

$$(7) \quad \Delta = \pi_{yy} \pi^*_{y^*y^*} - \pi_{yy^*} \pi^*_{y^*y} > 0.$$

It is a straightforward comparative statics exercise to identify the impact of a home country export subsidy on the two firms' equilibrium outputs. These are given by,

$$(8) \quad y_e \equiv (dy/de) = -\pi^*_{y^*y^*} / \Delta > 0, \text{ and}$$

$$(9) \quad y^*_e \equiv (dy^*/de) = \pi^*_{y^*y} / \Delta < 0.$$

The signs in (8) and (9) are determined by the uniqueness/stability condition in (7), the second-order condition in (6), and the assumption that the foreign firm's reaction function is downward sloping ( $\pi^*_{y^*y} < 0$ ). Finally, total differentiation of (1) with respect to  $e$  and application of the envelope theorem gives

$$(10) \quad \pi_e = yp' y^*_e + y > 0.$$

The expression in (10) is unambiguously positive by (9). Similarly, the marginal impact of a home country export subsidy on foreign profits is given by

$$(11) \quad \pi^*_e = y^*p' y_e < 0,$$

which is unambiguously negative given (8).

We are now able to determine the home government's optimal export subsidy policy. The domestic government is assumed to maximize total national welfare (net of subsidy costs). In the absence of domestic consumption and cross-ownership of firms, net national welfare is simply the

difference between the domestic firm's profits  $\pi(y, y^*; e)$  and total subsidy outlays  $e y$  (see equation (11) in Brander and Spencer (1985)). With foreign ownership, by contrast, domestic welfare depends directly on both firms' profit positions. Let  $s$  ( $0 \leq s \leq 1$ ) be the share of the home-based firm's assets held by that country's residents, and analogously let  $s^*$  ( $0 \leq s^* \leq 1$ ) denote the share of the foreign-based firm's assets owned by foreign residents. For simplicity, assume further that shareholders receive dividends in proportion to their ownership fractions. The home country's welfare is then given by

$$(12) \quad G(e) = s \pi(y, y^*; e) + (1-s^*) \pi^*(y, y^*; e) - e y.$$

Differentiation of (12) with respect to  $e$  and substitution of the relationships in (10) and (11) yields:

$$(13) \quad G_e = s (y p' y_e^* + y) + (1-s^*) y^* p' y_e - y - e y_e.$$

The welfare-maximizing export subsidy  $\bar{e}$  sets  $G_e = 0$ , yielding

$$(14) \quad \bar{e}(s, s^*) = \frac{s(y p' y_e^*)}{y_e} - \frac{(1-s)y}{y_e} + (1-s^*) y^* p'.$$

In the absence of cross-ownership ( $s = 1, s^* = 1$ ), equation (14) simplifies to

$$(15) \quad \bar{e}(s=1, s^*=1) = \frac{y p' y_e^*}{y_e},$$

which is unambiguously positive given (8) and (9). This yields Brander and Spencer's (1985) Proposition 2: the domestic government has a unilateral incentive to subsidize its firm's export sales. By providing the home firm with a credible commitment to expand output beyond the Cournot-Nash equilibrium point, the export subsidy increases that firm's world market share and thus its share of total industry profits.

In the more general case where cross-ownership exists ( $s < 1, s^* < 1$ ), the expression in (14) cannot be signed unambiguously. While the first term is positive — representing the (scaled down) standard profit-shifting effect — the second and third terms are negative — reflecting the worsening profit position of the foreign-based firm. Moreover, it is quite possible that the latter two terms dominate in (14), making an export *tax* optimal. This will occur when domestic residents hold substantial claims against the foreign-based firm's profits (small  $s^*$ ) relative to their

claims on the domestically-based firm's profits (small  $s$ ). In this case, while the export tax lowers the domestically-based firm's profits and thus lowers domestic residents' dividend receipts from that firm, this is more than offset by the increase in the foreign-based firm's profit streams received by its shareholders abroad.

Consistent with Lee (1990, Proposition 2), the optimal export subsidy is unambiguously lower when account is taken of cross-ownership stakes. To see this, consider the ratio of the subsidy rates in (14) and (15):

$$(16) \quad \frac{\bar{e}(s,s^*)}{\bar{e}(s=1,s^*=1)} = s - \frac{(1-s)}{p'y_e^*} + \frac{(1-s^*)y^*y_e}{y y_e^*}.$$

From (8) and (9), the ratio in (16) is unambiguously less than unity. Intuitively, cross-ownership thus dampens the case for strategic export subsidies on welfare grounds. A more interesting, empirical question to ask, however, is how large is the ratio in (16) in practice?

To answer this question, it is convenient to adopt specific functional forms for firms' costs and the industry inverse demand schedule. For simplicity, I assume a linear demand function and constant (but not necessarily common) marginal costs for the two firms. With these assumptions, equation (16) simplifies to,<sup>5</sup>

$$(17) \quad \frac{\bar{e}(s,s^*)}{\bar{e}(s=1,s^*=1)} = 4s - 3 - 2(1-s^*)\left(\frac{y^*}{y}\right).$$

The ratio in (17) can be calculated for specific U.S. industries given data on the percentage ownership of foreign-based firms by U.S. residents ( $1-s^*$ ), the extent of foreign ownership in U.S.-based firms ( $1-s$ ), and the ratio of non-U.S. to U.S. industry output ( $y^*/y$ ). Ideally, as earlier noted, foreign ownership positions should take account of not only direct and portfolio investments, but also technology licensing agreements, claims on joint ventures' profit streams,

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<sup>5</sup> Let  $p = a - b(y+y^*)$  denote the industry inverse demand schedule, and let  $c$  and  $c^*$  denote the home and foreign firms' respective (constant) marginal production costs. In the Cournot-Nash equilibrium, firms' optimal output rates are given by  $y = (a-2c+2e+c^*)/3b$  and  $y^* = (a+c-e-2c^*)/3b$ . It follows that  $y_e = (2/3b)$  and  $y_e^* = -(1/3b)$ . Further,  $p' = -b$ . Substitution of these terms into (16) and simplifying yields (17).

and all other forms of cross-ownership of assets. Regrettably, data for all but the first two of these components are not available in a comparable form across industries, and therefore attention must be focused here on direct and portfolio ownership positions. Given this undercounting of international cross-ownership, the estimates derived for the ratio in (17) must be interpreted as upper bounds.

Table 1 summarizes these data for 17 U.S. manufacturing industries, and calculates the ratio of optimal subsidies given in equation (17). The most recent year for which data for the required series were available was 1987. The appendix explains in detail the methodology and data sources used in deriving Table 1. Column (1) reports the percentage of U.S.-based firms' assets owned by foreign residents,  $(1-s)$ , and captures both direct foreign ownership and foreign residents' portfolio holdings in U.S. corporate stocks.<sup>6</sup> Column (2) reports the share of foreign manufacturing industry assets held by U.S. direct and portfolio investors,  $(1-s^*)$ . Regrettably, it was not possible to calculate this share on an industry basis, and therefore the manufacturing sector average is reported in its place. Column (3) reports the ratio of total non-U.S. to U.S. output by industry,  $(y^*/y)$ .

Finally, column (4) reports the ratio of the optimal export subsidy with and without foreign ownership positions taken into account. Following Brander and Spencer's (1985) international duopoly model, the calculations assume cooperative firm behavior within each country and non-cooperative behavior between countries.<sup>7</sup> The results are quite striking. For the manufacturing sector as a whole, incorporation of foreign ownership into the government's strategic trade policy calculus lowers the optimal export subsidy by 61%. There is significant variation across

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<sup>6</sup> Direct foreign ownership is defined in the United States as ownership by one foreign entity of 10% or more of the voting shares of a U.S. business enterprise. Foreign holdings below this threshold are classified as portfolio investments. The direct foreign ownership data included in columns (1) and (2)'s calculations include only the portion of a domestically based firm's total assets that are actually owned by foreign residents. The ownership values reported in Table 1 therefore are smaller than estimates reported elsewhere based on foreign affiliate investment data which attribute the full value of a foreign-controlled, domestically-based firm's assets to the foreign source.

<sup>7</sup> The implications of this assumption are discussed shortly.

**Table 1**  
**The Effect of Foreign Ownership on Optimal Export Subsidies**  
(1987 Data)

| Industry                       | (1)  | (2)                                      | (3)   | (4)                                      |
|--------------------------------|--|--|---|--|
|                                | Foreign Ownership<br>Share in U.S. Industry<br>(1-s) | U.S. Ownership<br>Share Abroad<br>(1-s*) | Ratio of Non-U.S.<br>to U.S. Output<br>(y*/y) | $\bar{e}(s,s^*)$<br>$\bar{e}(s=1,s^*=1)$ |
| All Manufacturing              | 12.36%   | 3.36%                                    | 1.70  | 0.391                                    |
| Food and Kindred               | 14.54  | 3.36                                     | 1.61  | 0.310                                    |
| Textile Mills                  | 10.25  | 3.36                                     | 2.17  | 0.444                                    |
| Paper and Allied               | 9.95   | 3.36                                     | 1.18  | 0.523                                    |
| Printing & Publishing          | 12.92  | 3.36                                     | 1.16  | 0.405                                    |
| Chemicals and Allied           | 18.72  | 3.36                                     | 1.85  | 0.127                                    |
| Industrial Chemicals           | 21.21  | 3.36                                     | 2.01  | 0.016                                    |
| Drugs                          | 18.56  | 3.36                                     | 2.18  | 0.111                                    |
| Petroleum & Coal Products      | 17.40  | 3.36                                     | 1.17  | 0.225                                    |
| Rubber & Misc. Plastics        | 13.03  | 3.36                                     | 1.98  | 0.346                                    |
| Stone, Clay & Glass Products   | 22.31  | 3.36                                     | 1.98  | -0.025                                   |
| Iron and Steel                 | 10.86  | 3.36                                     | 3.74  | 0.314                                    |
| Non-ferrous Metals             | 18.67  | 3.36                                     | 2.00  | 0.119                                    |
| Fabricated Metal Products      | 10.85  | 3.36                                     | 1.64  | 0.456                                    |
| Non-electrical Machinery       | 10.35  | 3.36                                     | 2.09  | 0.446                                    |
| Electrical & Electronic Equip. | 13.54  | 3.36                                     | 2.51  | 0.290                                    |
| Transportation Equipment       | 8.97   | 3.36                                     | 1.76  | 0.523                                    |
| Motor Vehicles & Equip.        | 8.94   | 3.36                                     | 2.46  | 0.447                                    |

Source: See Appendix for derivation and data sources.

industries, but the optimal export subsidy after accounting for foreign ownership is never more than 52% of the export subsidy implied by a standard strategic trade policy model such as Brander and Spencer (1985). In several industries with significant international cross holdings, such as industrial chemicals, drugs, chemicals and allied products, and non-ferrous metals, the optimal export subsidy is reduced by approximately 90%. In one sector, stone, clay and glass products, it becomes optimal to impose a small export *tax* rather than a subsidy. Finally, it should be re-emphasized that the estimates in column (4) understate the impact of foreign ownership on the optimal export subsidy by ignoring several important forms of cross-ownership.

One reason that optimal export subsidy rates decline sharply at even fairly modest cross-ownership levels stems from consideration of a duopoly model. Brander and Spencer (1985) show that the unilateral optimal export subsidy under duopoly competition replicates the Stackelberg equilibrium. In a Stackelberg duopoly with linear demand and constant marginal cost, the (subsidized) leader's profits rise by 12% relative to the Cournot equilibrium, while the (non-subsidized) follower's profits fall by 44%. (Aggregate industry profits decline by 16%.) When the domestic firm's exports are subsidized, therefore, domestic shareholders receive a partial share  $s < 1$  of a small increase in the domestically-based firm's profits, but suffer a loss of share  $(1-s^*)$  of a large decrease in the foreign-based firm's profits. The asymmetry in firms' profit responses lowers the subsidy's impact on domestic shareholder wealth and therefore makes an export subsidy less attractive. In this way, moderate levels of cross-ownership can have large consequences for optimal trade intervention.

As the number of firms in the industry increases, the asymmetry in firms' profit responses to trade taxes and subsidies narrows. This diminishes the magnification effect of a given level of cross-ownership in trade policy welfare calculations. Further, as Dixit (1984) shows, as the number of domestic firms grows an export tax becomes more likely to be optimal on welfare grounds because of inter-firm externalities. For both of these reasons, one might argue that by restricting attention to duopoly competition, Table 1 overstates the impact of foreign ownership upon the optimal export subsidy policy. Such a conclusion would be unwarranted, however, for it

is only in the small numbers case that strategic trade policy becomes relevant. As the number of firms increases, strategic profit-shifting incentives decrease for the simple reason that there are fewer profits to shift. Thus, as the number of firms increases, and the impact of a given level of foreign ownership on optimal trade policies falls, so too do the potential opportunities for strategic trade intervention. Empirically, therefore, foreign ownership has the greatest impact on welfare conclusions precisely in those settings where the strategic trade literature's welfare implications are at greatest variance with classical theory.

### **III. Targeting Strategic Trade Intervention to Specific Industries**

Barbara Spencer (1986) has identified firm and industry characteristics that strategic trade policy models suggest are most likely to yield welfare improvements from targeted trade policy intervention. These characteristics include: (i) high industry R&D intensity, (ii) a minimum of technology spillovers across borders, (iii) steep learning or experience curves, (iv) large economies of scale, (v) substantial product differentiation, (vi) high industry concentration and (vii) high barriers to entry. These "strategic" characteristics either create the potential for domestic firms to earn supra-competitive returns, or reduce the dissipation of those returns, or both.

An important empirical regularity overlooked by the strategic trade policy literature, however, is that rates of foreign ownership tend to be highest in sectors exhibiting precisely those characteristics. This correlation magnifies the empirical importance of incorporating the role of foreign ownership into trade policy welfare analysis. It implies that sectors that might appear to be among the most attractive targets for strategic intervention based on their cost or market characteristics will be among the least attractive based on their degree of international rent diffusion through cross-ownership stakes. In this section, I document the positive correlation that exists in American, Canadian and British manufacturing industries between foreign ownership shares and

the seven “strategic” industry characteristics identified above.<sup>8</sup> Section IV concludes by offering a strategic explanation for this observed correlation.

(i) High Industry R&D Intensity. The strategic trade policy literature suggests that research intensive industries provide attractive targets for profit-shifting trade policies. Protection of the home market (Krugman (1984)) or direct subsidization of domestic firms’ R&D investments (Spencer and Brander (1983)) in such industries can pre-empt cost-reducing innovations by foreign competitors, thereby increasing domestic firms’ market share and share of total industry profits. Profit-shifting may not translate into increased domestic shareholder wealth in these industries, however, because of the positive correlation between R&D intensity and foreign ownership shares. Caves’ (1974) study of 64 Canadian manufacturing industries found that R&D intensity (research and development expenditures as a percentage of sales) was a significant and positive determinant of the inter-industry pattern of foreign ownership shares. This positive correlation was found to be particularly strong among consumer goods industries (Caves (1974, Tables 1, 2)). Caves reports identical results for a sample of 36 manufacturing industries in the United Kingdom, and Buckley and Casson (1976, Table 4.5) document a strong, positive correlation between R&D intensity and multinational ownership in 26 industrialized countries. More recently, Grubaugh (1987, Table 2) has identified a strong, positive correlation between R&D and direct foreign investment propensities at the firm level for the United States. Thus, while profit-shifting trade policies may be potentially more potent in research intensive industries, international leakage of firm profits also tends to be more acute in those industries.

(ii) A Minimum of Technology Spillovers Across Borders. Firms’ ability to minimize technology spillovers to competitors is a prerequisite for successful profit-shifting in R&D intensive industries (Spencer (1986)). Empirically, however, innovation appropriability and

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<sup>8</sup> Ray (1988, 1991) analyzes the effects of trade policy and industry characteristics on firms’ incentives to make foreign direct investments relative to licensing domestic partners. Both investment forms create inter-firm profitability linkages, however, and thus in general both will influence the welfare effects of strategic trade policies. Because Ray provides information only on relative (and not absolute) correlations, it is not possible to draw upon his results in this section.



foreign ownership shares tend to be positively correlated, indicating that in industries where technology dissemination does not dampen the welfare benefits of profit-shifting in certain industries, international repatriation of firm profits will. Drawing upon evidence from Levin *et.al.* (1987, Table 2), U.S. industries where product and process patents are rated as most effective by innovating firms are precisely those industries displaying the highest foreign ownership shares, such as chemicals, drugs and petroleum products (see Table 1). Drawing upon the data in Table 1 and evidence from Mansfield (1985, Table II), there is also a strong, positive correlation across U.S. industries between foreign ownership shares and appropriability of R&D results, as measured by the average number of months that firms successfully protect the secrecy of their process innovations from competitors. Inter-firm technology leakages occur most slowly in the pharmaceuticals, chemicals and stone, clay and glass products industries according to Mansfield (1985, Table II), yet these three sectors also exhibit among the highest rates of foreign direct and portfolio investment among U.S. manufacturing industries. Again, therefore, the subsidy-dampening effect of foreign ownership is greatest in precisely those industries whose market characteristics might otherwise appear conducive to strategic trade policies.

(iii) Steep Learning or Experience Curves. Krugman (1984) has shown how dynamic scale economies can magnify the profit-shifting effects of strategic trade policies, thus suggesting that industries with steep learning curves will be among those offering the largest potential producer welfare gains. The positive correlation between the strength of production experience effects and foreign ownership across industries, however, again suggests otherwise. Lieberman (1984) has identified steep learning curves in a wide range of chemical processing industries. Lieberman (1984, Table 3) reports an average learning elasticity for this sector of  $-0.47$ , implying that unit costs decline on average roughly 30 percent with each doubling in cumulative industry output. Table 1 indicates that the industrial chemicals and chemicals and allied products sectors, however, are among the most heavily foreign-owned in the United States. Learning by doing is also an important determinant of changes in firms' costs over time in the semiconductor industry, with unit costs falling on average 25 to 30 percent with each doubling in cumulative firm output (Dick

(1991). Furthermore, firms' cost savings from acquired production experience do not appear to spill over to competitors in this industry, further increasing the potential attraction of profit-shifting trade policies. The semiconductor industry is also characterized, however, by extensive international equity holdings, plant investments, technology licensing, second-sourcing and joint venture agreements among American, Japanese and Western European producers (Haklisch (1986), U.N. Centre on Transnational Corporations (1986)).<sup>9</sup> Each of these inter-firm linkages erodes the identity between domestic firm profits and domestic shareholder wealth assumed in most strategic trade policy models.

(iv) Large Economies of Scale. Krugman (1984) illustrates how the profit-shifting effects of strategic trade policies will be magnified in decreasing cost industries. As with learning by doing, therefore, the potential producer welfare benefits of strategic trade intervention should be greatest in industries where scale economies are strongest. This greater potential is again frustrated in practice, however, by the fact that foreign ownership tends to be concentrated in decreasing average cost industries. Caves (1974, Table 1) finds that economies of scale, as measured by the size (relative to the market) of a plant large enough to exhaust economies of scale in production, are a positive and significant determinant of foreign ownership shares across Canadian manufacturing industries. Caves (1974, Table 3) reports a similar correlation among U.K. manufacturing industries. Again, therefore, subsidy-dampening effect of foreign ownership is greatest in precisely those industries highlighted by strategic trade policy models.

(v) Substantial Product Differentiation. Strategic trade policy models suggest that differentiated product markets provide more attractive targets for profit-shifting policies than do homogeneous goods markets. Foreign ownership patterns, however, again suggest otherwise. Caves (1971, p. 8) has noted generally that direct foreign investment in Canada, the United States and the United Kingdom has been concentrated in differentiated goods industries such as

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<sup>9</sup> For an analysis of second-sourcing in the U.S. semiconductor industry, see Dick (forthcoming).

automobiles, consumer durables, scientific instruments and chemicals. Firms in less differentiated industries such as paper, primary metals, lumber and textiles, by contrast, tend to have fewer foreign subsidiaries. Caves (1974, Tables 1 and 3) also documents that foreign ownership shares in Canada and the United Kingdom are strongly, positively correlated with industry advertising intensity, which he uses to proxy for the degree of product differentiation. Grubaugh's (1987, Table 2) more recent firm-level analysis for the United States confirms that both advertising intensity and product diversity<sup>10</sup> are positively and significantly correlated with direct foreign investment propensities. The mitigating welfare effects of international leakages of firm profits through repatriation will thus be greatest in industries where product differentiation would otherwise tend to make profit-shifting policies most attractive.

(vi) High Industry Concentration. The negative effect of an expansion in domestic competitors' outputs on the profits earned by any one domestic producer will be smaller the more highly concentrated is the domestic industry. High industry concentration thus acts to reduce negative pecuniary externalities among domestic rivals and thereby increases the probability that an export subsidy will be welfare enhancing (Dixit (1984)). Empirically, however, industry concentration and foreign ownership tend to be positively correlated, thus mitigating the potential advantage held by concentrated sectors. Baldwin's (1979, Table 3) sample of 27 U.S. industries finds that industry concentration is positively and significantly correlated with foreign ownership shares. Knickerbocker (1973) also finds a strong positive correlation between the four-firm concentration ratio and multinational investment in U.S. industries. Dunning (1973) and Buckley and Casson (1976, Table 1.8) report concurring results for the United Kingdom: U.S. affiliate firms tend to be clustered in industries with above average concentration rates.

(vii) High Barriers to Entry. Strategic trade policy can have lasting effects on domestic firms' profitability only if dissipation of supra-normal returns can be minimized. Entry barriers

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<sup>10</sup> Product diversity is measured as the number of four-digit SIC industries in which the firm is classified as producing.

therefore have been identified as an essential industry characteristic for successful international profit-shifting through trade policy (Spencer (1986)). Caves (1974, Table 1), however, documents that foreign ownership shares are highest in Canadian manufacturing industries with the highest barriers to entry, as measured by absolute capital requirements to enter the industry. Horst (1972) reports similar results for Canada, and Wolf (1977, Table 1A) for U.S. manufacturing industries. This positive correlation indicates that the entry barriers characteristic too must be evaluated more carefully before being designated as conducive to welfare-enhancing profit-shifting trade policies.

It is striking that *each* of seven characteristics highlighted by strategic trade policy models as being conducive to successful profit-shifting is correlated with the incidence of foreign direct ownership. In these sectors, the trade policy objectives of profit-maximizing domestic firms and wealth-maximizing domestic investors will tend to be the most divergent. Foreign ownership thus weakens the potential welfare-based argument in favor of strategic trade policy in precisely those sectors where its apparent appeal might appear to be the largest, and thus its temptation to trade policy-makers the greatest.

#### IV. Conclusion

This paper has illustrated empirically the sensitivity of strategic trade policy theory's welfare conclusions to the standard assumption that domestic residents hold claims only against domestic firms' profits and, symmetrically, that foreign owned firms are wholly owned by foreign residents. When international cross-ownership of assets occurs, domestic firms' profit maximization objectives will diverge from domestic shareholders' wealth maximization objectives. National welfare objectives therefore become more difficult to define along country borders. While maximization of domestic firm profitability may be assisted by import protection or export promotion, with complete asset diversification, maximization of domestic shareholder wealth is promoted when both governments refrain from strategic commercial policies.

The paper has made two simple yet noteworthy empirical observations. First, existing levels of international cross-ownership significantly lower optimal industry export subsidies implied by a simple strategic trade policy model. Second, the paper has shown that the quantitative importance of the foreign ownership caveat is greatest in precisely those industries whose cost or market characteristics might otherwise make strategic trade policies appear attractive on welfare grounds. The paper's conclusions raise several issues for further research including the optimal coordination of strategic investment and trade policies, the additional informational burdens placed on policy-makers seeking to adopt profit-shifting policies in the presence of foreign ownership, and transfer pricing incentives among transnational firms. Such issues await future research. I conclude this paper by discussing briefly two related issues.

First, Rodrik (1988) has recently raised the question of whether the strategic trade policy literature's lessons have particular relevance for developing economies, where markets may be less competitively organized and economies of scale may remain incompletely exploited. Rodrik's numerical simulations of trade liberalization policies suggest that developing economies' market structure characteristics complicate trade policy welfare analysis, but he concludes that on balance "the case for partial trade liberalization stands up well" in these market settings. This paper echoes these conclusions. Technology licensing agreements, off-shore production facility investments, and transnational enterprise operations yield particularly high levels of foreign ownership in developing economies. During the early 1970s, for example, 28% of Mexico's manufacturing output was sourced by foreign owned affiliates, 29% of Brazil's manufacturing sector assets were foreign held, and in Turkey the foreign ownership share was 41%.<sup>11</sup> In the presence of these high rates of foreign ownership, strategic trade policy's welfare consequences become particularly opaque.

Finally, Section III's findings raise an important question: is the statistical coincidence between foreign ownership shares and "strategic" firm and industry characteristics merely an economic

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<sup>11</sup> U.N. Economic and Social Council (1978), Tables III-59, III-60, III-61.

coincidence?<sup>12</sup> One could argue that precisely *because* an industry displays “strategic” characteristics it will tend to attract a disproportionate rate of foreign investment. Bhagwati *et. al.* (1987) have suggested that foreign direct investment may occur in industries with the greatest threat of future trade barriers in markets to which those firms export. According to this argument, domestic affiliates may pre-empt future trade restrictions by lobbying their host government.<sup>13</sup> A similar argument applies to potential strategic trade policy intervention. Even absent lobbying by foreign-owned affiliate firms, however, their mere presence itself serves to divorce the welfare objectives of domestic firms from those of domestic investors, and thus makes strategic trade policy less attractive to the host government.

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<sup>12</sup> For a survey of locational theories of foreign direct investment which may also be consistent with Section III's data, see Hood and Young (1979, ch. 2).

<sup>13</sup> As an example of the pre-emptive lobbying hypothesis, Bhagwati *et. al.* (1987) cite lobbying activities by General Motors, which has joint production facility investments with Toyota in the U.S., against the extension of voluntary export restraints on Japanese automobiles. Bhagwati *et. al.* attribute General Motors' less protectionist stance (relative to Ford and Chrysler) in part to Japanese direct investment in the firm. Ray (1991) provides some empirical evidence, however, that on aggregate a desire to circumvent current rather than potential trade barriers has been a more important determinant of foreign direct investment in the United States.

### Appendix : Data Sources and Derivation of Table 1

Column (1) reports the combined foreign direct and portfolio ownership shares in U.S. manufacturing industries. The first component was calculated as the ratio of the foreign direct ownership position (the book value of foreign parent firms' equity in their U.S. affiliates) to the book value of assets of all firms operating in the United States in that industry. These data were taken from *Survey of Current Business*, August 1991 (Table 17) and *Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations*, 1988 2nd quarter (Tables 1.1 to 16.1). In both cases, the data reported were year-end book values for 1987. Foreign portfolio shares were not available at the industry level. The average share of U.S. corporate stocks held by foreign portfolio investors was therefore applied to each industry. This average equals the market value of foreign residents' U.S. corporate stock portfolio holdings divided by the market value of domestic firms' shares traded on the New York or American Stock Exchanges. These data were taken from *Survey of Current Business*, June 1991 (Table 3) and *The International Federation of Stock Exchanges' 1987 Report: Activities and Statistics* (Table 1C). For 1987, the average foreign portfolio ownership share was 7.96%.

Column (2) reports the combined U.S. direct and portfolio investment ownership share of foreign manufacturing firms. Foreign industry-level data were unavailable, and therefore a manufacturing sector average was derived as follows. The average U.S. direct investment share abroad was calculated as the book value of the U.S. direct investment position abroad in five major industrialized countries' manufacturing sectors (Canada, France, Japan, the United Kingdom, and West Germany) divided by the sum total of those countries' manufacturing sectors' book value of assets. These data were taken from *Survey of Current Business*, August 1989 (Table 12) and *Non-Financial Enterprises Financial Statements*, 1990 (Tables E1/01, E1/04, E1/08, E1/17 and E1/21). The average U.S. direct foreign ownership share in the five countries' manufacturing sector in 1987 was 2.67%. The average U.S. portfolio ownership share abroad was calculated by dividing the market value of U.S. holdings of foreign corporate stocks by the sum market value of

33 non-U.S. stock exchanges' value of equity shares. These data were taken from *Survey of Current Business*, June 1991 (Table 3) and *1987 Report: Activities and Statistics* of the International Federation of Stock Exchanges (Table 1C). This average U.S. portfolio share abroad was 0.69% in 1987.

Column (3) reports the ratio of the value of total non-U.S. to U.S. output by industry. Non-U.S. firms were proxied by Canada, France, Japan, the United Kingdom and West Germany. These countries' output data were taken from *Industrial Statistics Yearbook*, 1988, Vol. 1 and were deflated by the 1987 bilateral average spot exchange rate. U.S. data were taken from the *1987 Census of Manufactures: General Summary* (Table 3).

Column (4) calculates the implied ratio of optimal export subsidies using the data in columns (1) through (3) and equation (17).



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