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THE DIRECT EFFECTS OF TRADE LIBERALIZATION ON FOREIGN DIRECT INVESTMENT: A PARTIAL EQUILIBRIUM ANALYSIS

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The Direct Effects of Trade Liberalization on Foreign Direct Investment: A Partial Equilibrium Analysis[1]

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ABSTRACT

We develop a partial-equilibrium model for analyzing the effect of trade barriers and their removal on the level of foreign direct investment. These changes operate through three channels. Lowering barriers to the firms' exports and to their imports of intermediate goods tends to stimulate FDI, while lowering barriers to imports of competing goods tends to discourage FDI. We simulate tariff elimination between the United States and the United Kingdom for eleven manufacturing sectors, and then add a tariff between the United Kingdom and the continental EU at the EU's MFN rate. The results highlight the importance of trade in intermediate goods in assessing trade-FDI linkages.

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[1] This paper represents solely the views of the authors and does not represent the views of the U.S. International Trade Commission or any of its Commissioners. The model presented in this paper was originally developed for Investigation 332-409, ***The Impact on the U.S. Economy of Including the United Kingdom in a Free Trade Arrangement with the United States, Canada, and Mexico***, U.S. International Trade Commission Publication 3339 (Washington, DC: USITC), August 2000. Phone and email for Michael Ferrantino are 1-202-205-3241 and *mferrantino@usitc.gov,* and for H. Keith Hall are 1-202-205-3238 and *khall@usitc.gov.* Our fax is 1-202-205-2340.

I. Introduction and Motivation

Increasingly, trade agreements have significantly addressed both trade liberalization and liberalization of foreign direct investment (FDI) simultaneously. The push to conclude liberalizations of this type reflects a belief by policymakers that there is a synergy between the two types of liberalization; the benefits of trade liberalization are stronger when FDI liberalization is undertaken simultaneously, and vice versa. If the policymaker is selling economic growth as an advantage of a trade liberalization agreement, the case is easier to make when the agreement is linked to FDI. While economists argue about the mixed quality of the evidence linking trade liberalization to economic growth (U.S. International Trade Commission (1997), Rodríguez and Rodrik (1999)), it is much clearer that the package of capital and technology which comes with FDI promotes growth, particularly for developing countries (Blomström, Lipsey, and Zejan (1994), Borensenztein, de Gregorio, and Lee (1998), Balasubramanyam, Salisu, and Sapsford (1996)).

However, if trade liberalization is undertaken in the absence of investment liberalization, it is not clear *a priori* whether the volume of FDI will grow or shrink. A certain part of FDI has a "tariff-hopping" motivation, i.e. it takes place to serve a market which cannot be served, or cannot be served as efficiently, by direct merchandise exports. Liberalizing merchandise trade could therefore cause a contraction of FDI. On the other hand, there is a substantial amount of intrafirm trade. For the United States, considering both outbound and inbound FDI together, some 35 percent of U.S. merchandise exports and over 40 percent of U.S. merchandise imports regularly consist of intrafirm trade (Zeile (1997)). Liberalizing this trade could well act as a stimulus to FDI. Moreover, foreign affiliates established through FDI do a significant amount of exporting; thus, trade liberalization could increase output in foreign affiliates by enhancing market access. Thus, the reduction of trade barriers may either stimulate or retard FDI, depending on the interplay of these various forces.

In order to address these issues, we developed a partial-equilibrium model of a market in which part of the output is produced by foreign-owned firms. This market is linked with markets in a specific trading partner and in the rest of the world, and is used to model bilateral liberalization between the two trading partners. Both foreign- and domestically-owned firms are influenced by tariffs through three channels. In the first channel (Figure 1), reducing the tariff in the country where the firms are located causes imported output to be substituted for locally produced output. One consequence of lowering the import tariff in the present model is that import-competing firms export supply function shifts outward. This channel has frequently been explored by partial-equilibrium modeling in the past (Francois and Hall (1997)). The second channel (Figure 2) operates through the fact that both types of firms import intermediate inputs which are subject to tariffs at different levels than the output tariff. Reduction of these tariffs reduces production costs, which in turn causes output to expand. In addition, both firms export a part of their output, which is tariff-ridden in the partner country's market. The stimulatory effect of tariff reduction on the portion of the output which is exported provides the third channel by which tariff liberalization can affect output (Figure 3). Differences in the data and calibration applied to

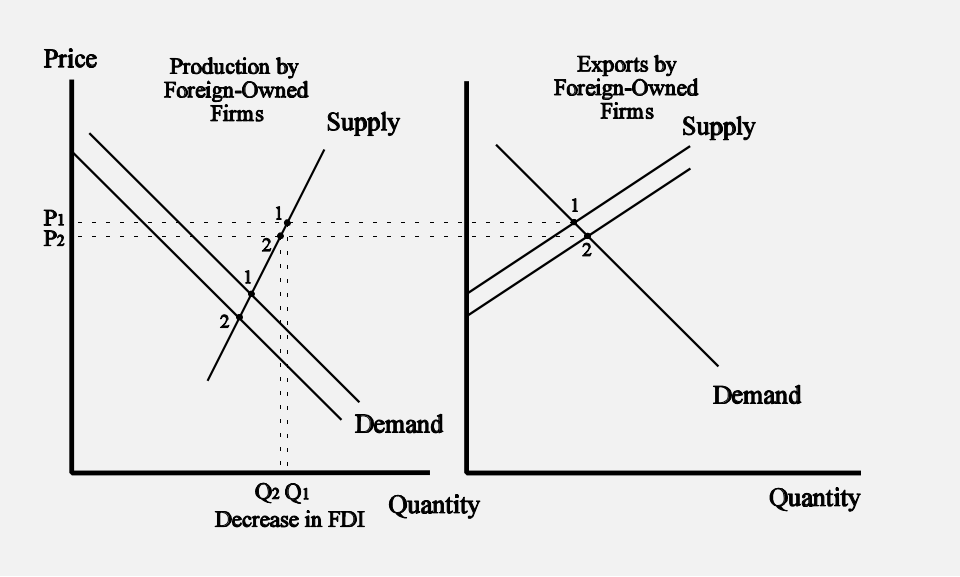

Figure 1
Lower tariffs on competing imports

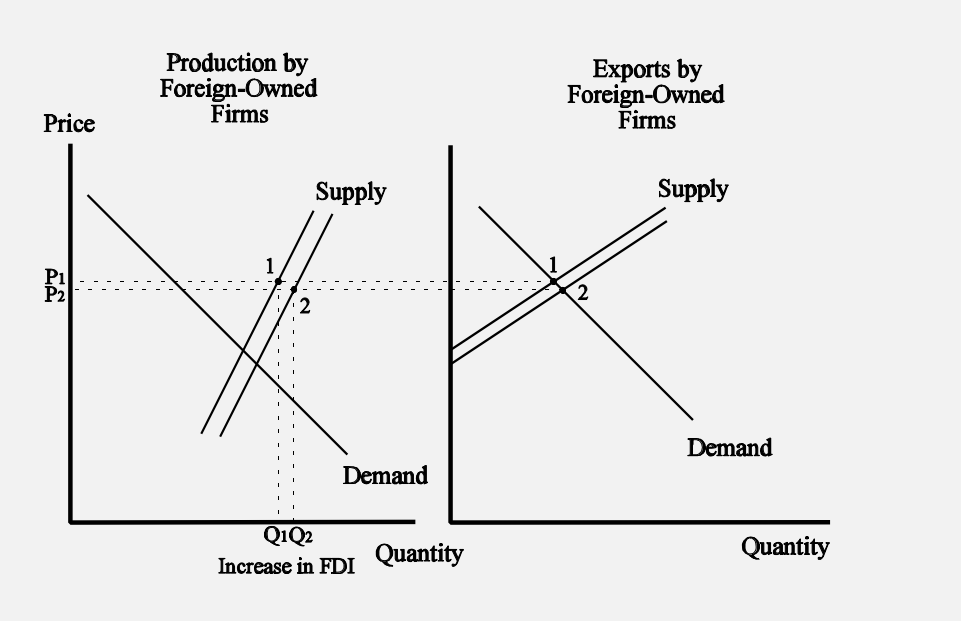

Figure 2
Lower tariffs on imported intermediate inputs

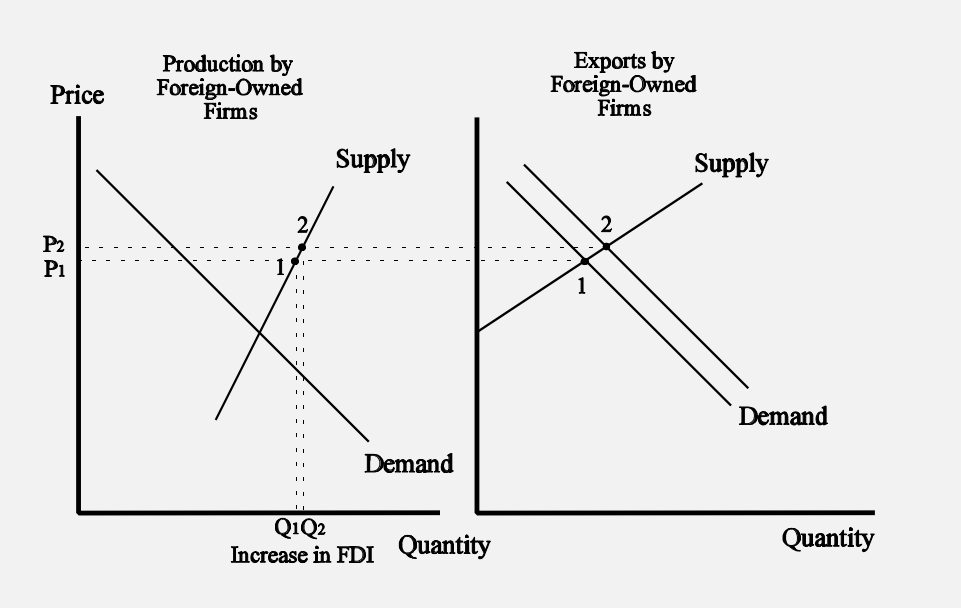

Figure 3
Lower tariffs on exports

foreign- and domestically-owned firms drive the results, and the output of the foreign-owned part of the industry is used as a metric for measuring the effects of tariff liberalization on FDI.

Application of the theoretical model enables us to generate new insights into a well-established question in the literature on FDI. It has been much debated whether FDI and trade are substitutes (should be expected to move in opposite directions) or complements (should be expected to move up and down together). Currently available results, both theoretical and empirical, are of limited use for practical assessment of the effects of actual tariff liberalizations on FDI. Theoretical models of FDI may permit trade and FDI to be either substitutes or complements, but rely on a variety of simplifications, such as extreme changes in trade or investment policy, or symmetries in transport costs (analogous to tariffs) or other attributes of countries and firms. As a consequence the analysis obtainable from such models tends to focus on drastic shifts between equilibria in which multinational firms suddenly replace or are replaced by arms' length merchandise trade, and are often so complex that simulation must be used in lieu of closed-form solutions.[2] However, industry-level data at a usable degree of aggregation for the United States indicate that arms' length trade, intrafirm trade, and final sales by foreign affiliates invariably coexist. The process of calibration enables us to relax many of the constraints imposed by the tractability requirements of pure theory, and to estimate marginal adjustments among the various observable quantities in response to trade policy changes of a realistic order of magnitude.

Similarly, results obtained using econometric methods in some cases analyze tariffs or transport costs, but must inevitably rely on statistical "control" for other factors, the quality of which depends on

[2] Horstman and Markusen (1987) and Brainard (1993) exemplify theoretical models worked out in closed form. Horstman and Markusen consider only drastic policy changes such as bans on importation or FDI. Brainard includes an iceberg transport cost which can be manipulated in a manner similar to a tariff, analyzing the cases both of a horizontally-structured industry and of a vertical industry in which firms manufacture in one country and have sales offices in another. The transport cost is the same value for shipments in either direction, but may vary as between the intermediate (manufactured) good and the final (sales office) good. For many sets of parameter values, either merchandise trade or FDI exist, but not both. Merchandise trade and FDI can exist simultaneously for a certain set of parameter values in which scale economies are neither too large nor too small relative to transport costs and tariffs. The results focus on tariff-hopping (substitution) as the primary relationship between FDI and trade; a potentially richer relationship between the intermediate and final-goods tariffs is implied but not fully worked out in closed form. Markusen, Venables, Konan and Zhang (1996) and Markusen (1997) represent examples of models which must be analyzed through simulation methods. These models permit horizontal multinationals, vertical multinationals, and national firms to coexist. The models contains a single transport cost, and their focus is on which of the different firm types will be observed at different equilibria. The "trade" of vertical multinationals is the trade in headquarters services of R&D rather than merchandise trade.

how well the equation has been specified. Blonigen (1999) reviews a large number of studies of this type. They generally find complementarity between trade and direct investment (i.e., increasing direct investment is associated with increasing trade).[3] His own results, for more narrowly defined products, suggest substitutability rather than complementarity. Use of partial-equilibrium methods permits a directly controlled experiment in which trade policy only is changed.

We apply the model to a set of eleven industries spanning the entirety of manufacturing, for markets in the United States and the United Kingdom, and model the bilateral removal of tariffs between the two countries, such as would occur if the UK were to join NAFTA.[4] In a variant of this basic scenario, U.S.-UK tariff removal is modeled simultaneously with an imposition of an MFN tariff between the United Kingdom and the rest of the EU, to reflect a situation in which the UK can join NAFTA only by giving up its current duty-free trade with the EU. From a purely modeling standpoint, there are significant advantages of considering such a scenario. The bilateral FDI flows and stocks linking the United States and United Kingdom are larger than between any other country pair in the world. Thus, the U.S. Commerce Department data for this relationship are of an unusually high level of quality and disaggregation, minimizing (though not entirely eliminating) the need to estimate values suppressed by disclosure requirements.[5] Second, since the bilateral tariffs are fairly small, the comparative static experiments engaged in are of a local kind for which the algorithms used in partial-equilibrium modeling

[3] Examples of studies using country- or industry-level data include Lipsey and Weiss (1981), Denekamp and Ferrantino (1989), Graham (1994), and Clausing (2000). Studies using firm-level data include Swedenborg (1979), Lipsey and Weiss (1984), Blömstrom, *et al.* (1988) and Belderbos and Sleuwagen (1998).

[4] This scenario was developed for U.S. International Trade Commission, *The Impact on the U.S. Economy of Including the United Kingdom in a Free Trade Arrangement with the United States, Canada, and Mexico*, Publication 3339, August 2000. The investigation leading to this report was initiated by a letter of the Senate Finance Committee on November 18, 1999, which appears as Appendix A of the report.

[5] According to BEA data, U.S. nonbank foreign affiliates of nonbank U.S. parents in the United Kingdom had $923.2 billion in assets and $337.9 billion in sales in 1997, while U.K-owned foreign direct investment in the United States amounted to $454.1 billion in assets and $258.9 billion in sales in the same year.

are the most precise. The political implications of the two scenarios are discussed briefly in Part III below; these are not the primary focus of this paper.

The results indicate that removal of bilateral tariffs on merchandise trade between the United States and the United Kingdom (ranging from 1.6 to 13.4 percent) increases output of foreign-owned affiliates by amounts ranging from 0.2 to 1.2 percent. These results, while consistent with complementarity rather than substitution, are relatively small quantitatively and arise from the fact that all three effects are operating simultaneously. In the second scenario, in which the United Kingdom joins NAFTA but loses preferential tariff status in the EU market, the output of U.S. manufacturing affiliates in the United Kingdom declines by an aggregate 0.56 percent, with no sector declining more than 2.2 percent. The sign of this result reflects the greater relative importance of the EU than the U.S. market for UK-based firms, while its small magnitude reflects the fact that most FDI is to serve the domestic market. Decomposition of the results shows that the effect of bilateral trade liberalization in cheapening intermediate inputs is the most important channel affecting FDI, while the role of increasing export market access is surprisingly large and is the most important of the three channels in some industries.

II. Description of the Model

For our simulations, we developed a multi-market, imperfect substitutes model linking imported intermediate inputs to a final goods industry that both competes with imports domestically and exports. The model is an Armington-type model in the sense that markets are assumed to be competitive and products are grouped by country of origin. We were therefore able to apply the model to each of the eleven industries in the US and in the UK and simultaneously estimate the effects of (1) eliminating final good tariffs on competing imports from a target country (either the UK or the US); (2) eliminating the tariffs on intermediate inputs into domestic production of the final good from the same target country; and (3) eliminating tariffs on exported products to the target country. For application to the UK market to simulate the simultaneous loss of preferential tariff status in the EU, we were also able to

simultaneously estimated the effect of (4) raising final goods tariffs on competing imports from a second target group of imports (the EU); and (5) raising tariffs on exported products to the second target group of countries. The structural equations of the model are described below.

The domestic final goods market is assumed to be split into four segments with imperfectly substitutable products: domestic production by (1) foreign-owned multinational firms from the target country, m, and (2) all other firms, including other multinationals, d; and imports from (3) the target country, u, and (4) the rest of the world, w.[6] All price elasticities of demand are assumed constant so that the demand functions may be represented as follows:

$$Q_i = k_i P_m^{h_{im}} P_d^{h_{id}} P_u^{h_{iu}} P_w^{h_{iw}} \quad \text{for i = m, d, u, w} \tag{1}$$

where each ς_{ij} is the price j elasticity of demand for product i and each k_i is a constant. The model is calibrated by scaling initial domestic sales to set all four domestic market prices equal to one. Each constant is therefore equal to initial domestic sales:

$$k_i = \overline{Q_i} \quad \text{for i = m, d, u, w}$$

where the bar denotes the initial value.

Final good production in all four industry segments is assumed to have a constant-elasticity-of-supply form. For imports, supply is a function of prices and tariffs on the final goods. For domestic production, supply is a function of prices and, indirectly through the unit cost of production, tariffs on imported intermediate inputs. That is, tariffs on imported intermediates are assumed to affect the cost of domestic production, which then affects supply in the same manner as tariffs on final goods. We therefore have the following supply functions

$$Q_i = ks_i \left(\frac{P_i}{c_i} \right)^{e_i} \quad \text{for i = m, d} \tag{2a}$$

[6] For example, a final goods market in the U.S. is split into domestic production by UK-owned multinationals, other domestic production, U.K. imports, and imports from other countries.

and

$$Q_i = ks_i \left(\frac{P_i}{1+t_i} \right)^{e_i} \quad \text{for i = u, w} \tag{2b}$$

where each ε_i is an elasticity of supply to the domestic market, t_i is an average ad valorem tariff rate, ks_i is a supply constant, and c_i is a unit cost of production. When the model is calibrated, the initial unit cost is set at one and the supply constants are a function of initial sales in the domestic market and, in the case of imports, the current average US tariff on final goods:

$$ks_i = \overline{Q_i} \left(1+\bar{t}_i\right)^{e_i} \quad \text{for i = u, w}$$

and

$$ks_i = \overline{Q_i} \quad \text{for i = m, d}$$

where the bars denote an initial values.

Since final good production uses some imported intermediate inputs from the UK that are subject to import tariffs, the intermediate goods market is split into two segments: (1) imported intermediate inputs from the target country, t, and (2) all other inputs, o. Both price elasticities of supply are assumed constant, so that

$$x_j = Ks_j \left(\frac{r_j}{1+t_j} \right)^{e_j} \quad \text{for j = t, o} \tag{3}$$

where calibration sets the constants equal to

$$Ks_j = \bar{x}_j \left(1+\bar{t}_j\right)^{e_j} \quad \text{for j = t, o}$$

and the bars denote an initial value.

Imported intermediate inputs are assumed to substitute with all other inputs into production of both types of domestically produced final goods (foreign-owned multinationals from the target country and all other domestic production) with a Cobb-Douglas unit cost function

$$c_i = r_t^{k_{it}} \, r_o^{k_{io}} \quad \text{for i = m, d} \tag{4}$$

where each r_i is an intermediate input price and each constant k_{ij} is normalized to equal the initial share of factor j in the cost of producing final good i. Further, the derived demands for both inputs in each final good production is

$$x_{it} = K_{it}\left(\frac{r_o}{r_t}\right)^{k_{io}} \quad \text{for i = m, d} \tag{5a}$$

and

$$x_{io} = K_{io}\left(\frac{r_t}{r_o}\right)^{1-k_{it}} \quad \text{for i = m, d} \tag{5b}$$

where calibration sets the constants

$$K_{ij} = \overline{x_{ij}} \quad \text{for i = m, d and j = t, o.}$$

Both foriegn-owned multinationals from the target country and all other domestic producers are assumed export to (1) the target country; and (2) the rest of the world. They are assumed to face the same constant demand elasticity for exports, $ç_x$, as follows (respectively):

$$Qu_i = ku_i P_i^{h_x} \quad \text{for i = m, d} \tag{6a}$$

and

$$Qw_i = kw_i P_i^{h_x} \quad \text{for i = m, d} \tag{6b}$$

where each ku_i and kw_i is a constant. Since the model is calibrated on domestic prices, the constants for sales to the target country include the effect of the initial ad valorem tariff applied to the exports (t_x):

$$ku_i = \overline{Qu}_i\left(1 + \bar{t}_x\right)^{h_x} \quad \text{for i = m, d}$$

where the bar denotes the initial value.

III. The Scenario

Policy Experiments

The first scenario (the "UK-NAFTA" scenario) removes bilateral tariffs on merchandise tradese trade between the United States and United Kingdom, analyzing the effects on the output of U.S.-owned affiliates in the United Kingdom and UK-owned affiliates in the United States. This is accomplished by reducing each of the three tariffs in the base data to zero. In the case of U.S.-owned affiliates in the United Kingdom, the three tariffs are the UK tariff on imports from the United States of the product being modeled, the UK tariff on imports from the United States of intermediate inputs used by the sector, and the U.S. tariff on exports of the sector from the United Kingdom to the United States. Correspondingly defined tariffs are removed in the modeling of UK-owned affiliates in the United States.

The second scenario (the "UK out of Europe" scenario) modifies the analysis of U.S. direct investment in the United Kingdom. Tariffs are lowered between the UK and the United States, and simultaneously raised between the UK and the European Union to the level of the EU's common external tariff. As an alternative to adding additional equations to the partial equilibrium model, so that the United Kingdom would have three trading partners instead of two, we aggregate the UK's trade flows with the United States and European Union, and change the tariffs by an trade-weighted amount which aggregates the tariff cut applying to UK-U.S. trade and the tariff increase applying to UK-EU trade. In almost all cases this procedure gives a tariff increase because of the larger trade flows between the UK and EU.

The Treaty of Rome provides that the EU negotiates commercial relations jointly for each of its individual members, and imposes a common external tariff for nonmembers. For the UK to negotiate a free trade agreement with NAFTA countries, these arrangements would need to be either renegotiated or abrogated. In a commercial policy sense, the first scenario can be understood as applying to a situation in which the UK unilaterally leaves the EU in order to join NAFTA while simultaneously negotiating with

the EU a separate duty-free arrangement similar to that currently enjoyed by Norway, Switzerland, Iceland and Liechtenstein in the European Economic Area (EEA). The second scenario corresponds to a situation in which the EU is unwilling to negotiate EEA-type status for the UK and imposes the common external tariff on it instead, assuming for the sake of convenience that the UK adopts the CET as its own MFN tariff. In the second scenario, it is possible to examine the extent to which the United Kingdom's preferential market access to the EU is an important motive for FDI in the United Kingdom. Such a motive could arise if U.S. affiliates located in the United Kingdom do a significant share of business exporting to the European Union.

Data Issues

For purposes of the simulation, we aggregate all of manufacturing into eleven sectors as follows: (1) food, beverages, and tobacco; (2) textiles, apparel, and leather; (3) wood and furniture; (4) paper, printing and publishing; (5) chemical products; (6) non-metallic minerals; (7) primary and fabricated metals; (8) industrial machinery and equipment (including computers); (9) electronic and other electrical equipment; (10) transport equipment; and (11) other manufacturing. A concordance between these eleven sectors and the aggregations in each of our primary data sources appears as an Appendix to this paper.

Within each country, there are significant differences between the sectors in their degree of exposure to trade (both in aggregate and from the partner country we focus on), their exposure to FDI from the partner country, and the levels of tariff protection for the various trade flows which may influence FDI. These differences in industrial structure drive the differences across sectors and countries in the results we obtain. While some of the basic inputs of the model can be directly drawn from primary sources, others must be estimated using reasonable inferences from the available data. These inferences pertain not only to the elasticities, as is customary, but to some of the trade flows and tariff levels themselves, and to the level of apparent consumption. Analysis of the type presented here is made feasible both by making such inferences and by combining data from several sources. This process

inevitably involves judgments on the part of the analysts which may potentially affect the results. We therefore describe the data construction process in somewhat more than usual detail.

The data are calibrated for a base year of 1997, the most recent year for which a matching set of data elements was available. Total output for each sector modeled is taken from the OECD's *STAN Database for Industrial Analysis*. In the analysis of the U.S. market, output of UK-owned multinationals is taken from Department of Commerce, Bureau of Economic Analysis, *Foreign Direct Investment in the United States: Preliminary Results from the 1997 Benchmark Survey*. In the analysis of the UK market, output of U.S.-owned multinationals is taken from Department of Commerce, Bureau of Economic Analysis, *U.S. Direct Investment Abroad: Operations of U.S. Parent Companies and their Foreign Affiliates, Preliminary 1997 Estimates*. "Other" output in the United States (both U.S.- and third-country owned) is calculated as the difference between aggregate sector output and output of UK-owned firms, while "other" output in the United Kingdom (both UK - and third-country owned) is calculated in an analogous manner.[7]

For output and for other BEA series, data for all non-bank affiliates (contained in BEA's set of Table II data) is used whenever possible. Some observations in the published BEA data are suppressed due to disclosure reasons. The suppression covers two or more observations at a similar level of aggregation. When Table II data are suppressed, published data for majority-owned affiliates (Table III data) are used when available, as the totals for these are usually close to those for all non-bank affiliates. In some cases, both Table II and Table III data are suppressed. The suppressed elements are then estimated by allocating the total of the suppressed elements among the individual elements using row (industry) or column (country) totals at the next higher level of aggregation.

[7] In the case of "other manufacturing" in the UK market, the joint use of total output, subject output, and trade data from different sources implied that the output produced by "other" (mainly domestic) sources for the domestic market was negative. In this case, total output was adjusted upward to give reasonable results for "other" output. For other sectors as well, the possibility of non-trivial measurement error in "other" output due to the use of data from different sources may be a significant limitation on the precision of the estimates.

For the analysis of the U.S. market, data for aggregate trade and for trade with the United Kingdom are taken from U.S. Commerce Department sources. Data for total exports and intermediate imports of UK-owned MNCs in the United States is taken from the BEA's FDIUS data; exports of UK-owned MNCs to the foreign parent group is used to proxy exports of UK-owned MNCs to the UK. The intermediate imports from the United Kingdom of other (non-subject) firms are estimated by taking all UK exports to the United States at the one-digit SITC level (from the *World Trade Analyzer* database produced by Statistics Canada), concording these with categories in the U.S. input-output table for 1992, and assigning a certain share of these imports to intermediate goods in each of the 11 sectors of analysis using ratios from the U.S. input-output table. Intermediate imports of other firms in each sector are generated by subtracting imports of UK-owned affiliates as found in the BEA data. Other trade data elements, such as trade with the rest of the world, are calculated as residuals.

For the analysis of the UK market, data for aggregate exports is taken from STAN for 1996, adjusted for growth of aggregate exports of all commodities from 1996 to 1997. Data for aggregate imports and for exports and imports between the UK and either the UK or EU is taken from the U.N. COMTRADE database. Data for exports of U.S.-owned firms to the United States and intermediate imports of U.S.-owned firms from the United States are taken from the BEA's USDIA data. Exports of U.S.-owned firms to the European Union are calculated as a share of sales to third markets, based on historical market shares for aggregate trade in the sector. Intermediate-goods imports of firms other than U.S.-owned firms are estimated using a procedure similar to that used in the analysis of the U.S. market, using the ratios in the U.S. input-output table on the assumption that production technologies in both markets are similar. Total intermediate-goods imports from the EU are allocated between subject (U.S.-owned) and non-subject firms according to their shares in output.

The WTO's *Integrated Data Base* was used to aggregate the MFN tariff schedules of the United States and the European Union (i.e. the United Kingdom) to the level of aggregation used in the study. The import tariff in the U.S. market is the same as the tariff facing exports from the UK market to the

U.S. market, and vice versa. The tariff on intermediate goods was calculated as a weighted average of the 1-digit SITC tariffs on each type of intermediate input used in the output of each sector, using the same weights as used to calculate the value of non-subject intermediate imports.

The relevant elasticities for the model (domestic supply, substitution between domestic output and imports, and aggregate demand) are chosen from a range of elasticities developed by USITC staff in a variety of studies and drawn originally from relevant econometric literature[8], and vary across sectors. When not otherwise indicated, the estimates shown are at the midpoint of the range of elasticities used. The elasticity of demand for inputs other than the imported intermediate input is uniformly set at 10, in order to give a reasonable approximation to perfect elasticity without requiring the evaluation of contingent formulae which would arise from directly introducing a value of infinity. Sensitivity analysis with respect to the elasticities is described below.

Table 1 below shows how the various manufacturing sectors in the United States and United Kingdom differ in terms of the variables which are most relevant for the model results. The penetration of U.S. multinationals in the UK market is significant, exceeding 30 percent of output in three of the 11 sectors and ranging between 10 and 30 percent of output in another four sectors, while the share of UK-owned output in the U.S. market never exceeds 8 percent in any of the sectors. U.S. multinationals in the UK are more likely to export to the home market than are UK-owned multinationals in the United States, and are also more likely to face competition from arms' length imports from the home market. On both sides of the Atlantic, electronic and other electrical equipment have a high share of costs consisting of imports from the home country, about 18 percent. Tariffs on food, beverages and tobacco and on textiles, apparel and leather are high in both countries, and the pattern of tariff peaks are relatively similar. This, combined with the significance of the diagonal elements in the input-output matrix, causes

[8] Sources consulted include the databases of elasticities for both partial-equilibrium models (including Hufbauer and Elliott (1994) and USITC (199*) and CGE models such as GTAP and the USDA's SWOPSIM model.

the three tariffs which the model eliminates to be of relatively similar magnitude across sectors, with some regression to the mean observed for the tariff on intermediate imports.

IV. Primary Results

Results of the Liberalization Experiments

Table 2 reports the primary results of the liberalization experiments in terms of changes in output of the foreign-owned sector and changes in trade of the foreign-owned sector with the home country. While the model generates results for a number of other variables, these are the most relevant for the performance of FDI.

In the experiment for which tariffs are eliminated between the UK and NAFTA while the UK maintains its current preferential access to the EU, output of UK-owned firms in the U.S. market increases by $407 million (0.48 percent) while output of U.S.-owned firms in the UK market increases by $413 million (0.41 percent). Increases in output range from 1.19 percent in the U.S.-owned apparel sector in the UK market, which faces high tariffs and has a relatively high export orientation toward the United States, down to 0.02 percent for the UK-owned wood and furniture sector in the United States, which does minimal transactions with the United Kingdom at relatively low tariffs.

Bilateral trade between the United States and United Kingdom grows more in percentage terms than does output, and each firms' exports to their home markets grow significantly more rapidly than their imports from that same market (24.3 percent to 5.6 percent for UK-owned firms in the United States, 14.8 percent to 3.0 percent for U.S.-owned firms in the UK). This does not lead to a large imbalance as one might suppose; of the total trade which is associated with FDI, there is an estimated increase of $1,252 million in exports from the United States to United Kingdom, and an increase of $947 million in exports from the United Kingdom to the United States, for an increase in net U.S. exports to the UK of $305 million. Removing the outlier of the U.S. electronics industry in the U.K, which has a

big swing to net imports as a result of the liberalization, leaves a more balanced picture with net U.K. exports increasing rather than net U.S. exports.

The reason that most of the adjustment takes place on exports rather than imports arises from the microfoundations of the model. First, while all of the three channels for liberalization increase exports to the target country, two of the channels do so because of supply shocks that also increase exports to other countries. That is, both lower tariffs on final good imports and lower tariffs on intermediate input imports reduce the opportunity cost of exporting to all markets rather than to just the target country. Imports are only increased through preferential treatment of the target country. Second, we may be under-estimating the effects of liberalization on imports from the target country since the market for each country is estimated in a separate partial equilibrium. In fact, while the growth of, e.g., the UK chemical industry increases its demand for U.S. imports, this channel is not reflected in the demand for exports represented in the model of the U.S. chemical industry, nor in other U.S . industries which may sell to the UK chemical industry. Only a more general model capturing a simultaneous equilibrium for both the US and the UK markets would capture this secondary effect of liberalization of trade in intermediate inputs.

Another factor causing most of the modeled adjustment to fall on exports is our assumption that final goods for the domestic market and for exports market are perfect substitutes in production. However, on the import side we do not assume that imported intermediate inputs from the target country are perfect substitutes with “all other” inputs into domestic production of the final goods. In fact, since imported intermediate inputs and all other inputs are broad groupings of various types of factors, we assume that final goods follow a Cobb-Douglas production function with relatively low substitutability (-1) between them.

As expected, the effect of granting U.S.-owned firms in the UK NAFTA-type preferences while eliminating their EU preferences leads to a contraction of output. This amounts to 0.93 percent in aggregate (917 million dollars), which is associated with large contractions in trade. The magnitude of the negative effects in the second scenario is about twice the size of the positive effects in the first

scenario, and reflects the fact that UK-EU trade flows are larger than UK-U.S. trade flows. However, the output effects are relatively muted compared to the tariff changes. In fact, for all experiments, the estimated percentage change in output in each industry is smaller than the size of the ad valorem tariffs being removed.

Decomposition of the Results

We ran additional experiments in which we shocked one of the tariffs at a time rather than all three simultaneously. In one set of experiments, we removed the arms' length import tariff only, in another the tariff on intermediate imports and in another the tariff on exports. None of these experiments can be readily compared to a trade agreement that would actually be negotiable. Their purpose is to see how much of the behavior of the model can be explained by tariff-hopping effects, cost-reducing effects and market access effects respectively.

One of the computationally convenient features of the model is that the estimated output changes obtained by shocking each of the individual tariffs add up almost precisely to the estimated output changes obtained by shocking all three tariffs (i.e. $409 million vs. $407 million for UK-owned firms in the United States and $414 million vs. $413 million for U.S.-owned firms in the United Kingdom). Thus, running the experiments on individual tariffs can be used to generate a decomposition of the relative strengths of the forces operating on the post-liberalization equilibrium. The results of this decomposition are reported in Table 3, for the first scenario.

Aggregating the results for the U.S. and UK markets together, approximately 67 percent of the increase in output arises from removing the tariff on intermediates, 52 percent arises from removing the tariff on exports, making 119 percent, with -19 percent being accounted for by the contraction in output associated with removing the arms' length import tariff (i.e. removing the motive for tariff-hopping behavior). In the UK market, the weights of the effects flowing from intermediate-goods imports and exports are approximately equal, while in the U.S. market the effects flowing from the intermediates-goods market is significantly larger.

The finding that trade liberalization in general tends to stimulate FDI is consistent with the observation in the empirical literature cited above that trade and FDI tend to be complements rather than substitutes. The importance of the intermediate goods tariff suggests that a significant part of this complementarity has to do with vertical integration within the multinational firm. The importance of export market access will probably surprise economists who are used to CGE experiments in which the effects of removing a country's import tariffs tend to dwarf the market access effects arising from the other country's liberalizing. Either export market access really is more important (and thus, trade negotiators more right than economists tend to give them credit for!) or their apparent importance has to do with the micro structure of the model as described above. Permitting greater substitution between imported and other inputs, for example, or constraining the partner country's demand for exports as would be done in a CGE context, would likely make the importance of intermediate goods imports increase relative to exports, which would in turn reinforce the stories currently being told about *why* trade and FDI are complements.

Sensitivity Analysis

Since there is significant uncertainty about the appropriate elasticities to use in the model, additional estimates were made to test the sensitivity of the model to alternate values of the elasticities. This was done by choosing the high and low values of the elasticites of domestic supply, import supply, domestic demand, and substitution from the sources surveyed, and conducting a grid search over the sixteen combinations of elasticities arising therefrom. A few combinations were omitted for which the absolute value of the elasticity of domestic demand exceeds the elasticity of substitution, since this gives rise to an unrealistic Giffen good-type effect known as the "Henning conundrum" (Francois and Hall (1997), pp. 138-139). Table 4 provides the range of elasticities searched over while Table 5 provides the results for the first scenario.

Several generalizations can be made about the sensitivity analysis. One is that even using values of the elasticities designed to produce large changes in output, the estimated changes in output are still

smaller in percentage terms than the tariffs being removed. The second is that the ranking of industries in terms of whether they experience large or small percentage changes in output is relatively robust to changes in the elasticities. This suggests that the results are driven primarily by the initial share of FDI in total output, the magnitude of the relevant trade flows relative to the market, and the size of the protection being eliminated. Notice also that using extreme values of the elasticities never leads to a sign reversal. That is, it is never the case that the tariff-hopping motivation outweighs the two motivations leading to complementarity of trade and FDI. The third result, not observable from Table 5 but apparent on examination of the results for individual industries, is that the minimum values of output changes usually occur when all four of the elasticities are at their minimum in absolute value, and the maximum values of output changes usually occur when all four of the elasticities are at their maximum in absolute value. While this last generalization does not hold precisely, it is a good approximation.

V. Conclusions

We have developed a computable partial equilibrium model which allows us to relate changes in trade protection to changes in the production and trade activity of multinational firms, as well as of the industries they operate in. The model takes into account three ways in which trade and investment could be linked - the tariff-hopping motivation, the cost of intermediate goods, and the expansion of export opportunities. The results strongly indicate that trade liberalization is associated with expanded scope for FDI, but that the magnitude of this scope is constrained to small values by underlying conditions of supply and demand.

The small percentage changes observed arise in large part from the fact that tariff barriers between the United States and United Kingdom are already fairly low. For developing countries, with larger barriers to liberalize, the potential benefits of trade liberalization for stimulating FDI, and in turn economic growth, are potentially much larger. Applying models of this type to developing countries

awaits improved methods for generating or inferring the necessary data, which happened to be of relatively high quality in the case analyzed.

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Table I Structural characteristics of sectors

In the U.S. market - Target MNCs are UK-owned; target trade flows are between the U.S. and UK; import tariffs imposed by U.S; exports face	Share of target MNCs in industry output	Share of target exports in target MNC	Share of target imports in UK MNC cost	Ratio of target arms' length imports to apparent U.S. consumption	Ratio of target exports to total output	Tariff on arms' length imports	Tariff on exports	Tariff on intermediate imports
Food, beverages, tobacco	3.9%	1.1%	3.1%	0.2%	0.2%	11.52%	13.35%	15.17%
Textiles, apparel, leather	1.2%	2.1%	1.7%	0.4%	0.4%	10.55%	8.83%	6.93%
Wood, furniture	0.1%	0.7%	0.7%	0.1%	0.3%	3.36%	3.64%	5.59%
Paper, printing, publishing	2.1%	3.2%	0.7%	0.2%	0.3%	1.65%	5.03%	5.91%
Chemical products	6.6%	3.0%	9.2%	1.0%	0.5%	4.51%	5.12%	4.19%
Non-metallic minerals	7.9%	1.2%	1.4%	0.4%	0.2%	6.42%	4.64%	2.99%
Primary and fabricated metals	1.8%	0.9%	6.6%	0.3%	0.2%	3.89%	3.90%	2.61%
Industrial machinery and equipment (including computers)	3.2%	1.6%	1.4%	2.0%	2.1%	1.62%	1.61%	2.34%
Electronic and other electrical equipment	1.2%	5.9%	18.3%	0.7%	1.3%	2.19%	2.57%	2.65%
Transport equipment	1.6%	1.6%	2.5%	0.8%	1.3%	3.15%	4.83%	2.30%
Other manufacturing	2.2%	4.3%	4.2%	1.4%	2.2%	3.88%	3.30%	4.42%

Table 1 (continued)

In the UK market (Scenario I) - Target MNCs are U.S.-owned; target trade flows are between the UK and U.S.; import tariffs imposed by UK; exports face tariffs imposed by U.S.	Share of target MNCs in industry output	Share of target exports in target MNC output	Share of target imports in UK MNC cost	Ratio of target arms' length imports to apparent U.S. consumption	Ratio of target exports to total output	Tariff on arms' length imports	Tariff on exports	Tariff on intermediate imports
Food, beverages, tobacco	13.1%	0.7%	0.6%	1.0%	1.0%	13.35%	11.52%	8.84%
Textiles, apparel, leather	6.2%	10.5%	2.4%	2.4%	2.5%	9.43%	10.74%	5.99%
Wood, furniture	5.9%	13.9%	1.2%	2.4%	1.5%	3.64%	3.36%	5.55%
Paper, printing, publishing	10.2%	7.1%	5.5%	2.0%	1.1%	5.03%	1.65%	5.64%
Chemical products	33.2%	2.0%	3.3%	3.6%	5.1%	5.12%	4.51%	5.38%
Non-metallic minerals	5.0%	5.2%	2.5%	0.9%	1.7%	4.64%	6.42%	5.29%
Primary and fabricated metals	7.4%	2.4%	5.4%	2.1%	2.3%	3.90%	3.89%	4.18%
Industrial machinery and equipment (including computers)	39.5%	9.4%	6.0%	12.3%	12.1%	1.61%	1.62%	3.80%
Electronic and other electrical equipment	18.7%	5.6%	18.4%	11.8%	6.2%	2.57%	2.19%	3.74%
Transport equipment	28.7%	5.3%	4.9%	1.0%	3.4%	4.83%	3.15%	2.95%
Other manufacturing	30.8%	6.3%	11.5%	13.5%	16.4%	3.63%	5.14%	5.12%

Table 1 (continued)

In the UK market (Scenario II) - Target MNCs are U.S.-owned; target trade flows are between the UK and U.S./EU; import tariffs imposed by UK; exports face tariffs imposed by U.S. and EU	Share of target MNCs in industry output	Share of target exports in target MNC output	Share of target imports in UK MNC cost	Ratio of target arms' length imports to apparent U.S. consumption	Ratio of target exports to total output	Tariff on arms' length imports	Tariff on exports	Tariff on intermediate imports
Food, beverages, tobacco	13.1%	5.5%	3.4%	9.7%	6.8%	-10.68%	-9.74%	-6.63%
Textiles, apparel, leather	6.2%	27.0%	22.1%	27.4%	27.1%	-7.78%	-7.59%	-3.66%
Wood, furniture	5.9%	31.6%	37.0%	18.8%	10.1%	-2.70%	-2.57%	-1.04%
Paper, printing, publishing	10.2%	25.8%	26.0%	13.5%	7.8%	-3.54%	-4.06%	-0.65%
Chemical products	33.2%	16.5%	18.8%	22.6%	30.6%	-3.49%	-3.52%	-3.11%
Non-metallic minerals	5.0%	23.3%	16.6%	9.4%	8.3%	-3.72%	-2.43%	-2.05%
Primary and fabricated metals	7.4%	22.7%	32.0%	17.9%	16.7%	-2.97%	-2.84%	-3.19%
Industrial machinery and equipment (including computers)	39.5%	50.4%	12.6%	41.5%	48.5%	-0.65%	-0.80%	-1.56%
Electronic and other electrical equipment	18.7%	25.1%	27.4%	39.5%	42.7%	-1.03%	-1.88%	-1.08%
Transport equipment	28.7%	20.1%	11.8%	36.5%	25.9%	-4.55%	-3.77%	-1.73%
Other manufacturing	30.8%	23.0%	14.7%	47.1%	58.3%	-1.13%	-1.17%	0.23%

Table 2 - Estimated Changes in Output and Bilateral Trade

	UK - owned firms in U.S. market			U.S. - owned firms in UK market(Scenario I)			U.S. - owned firms in UK market (Scenario II)		
	Output	Exports to UK	Imports from UK	Output	Exports to U.S.	Imports from U.S..	Output	Exports to U.S./EU	Imports from U.S./EU
In percentage terms									
Food, beverages, tobacco	0.30%	52.08%	12.46%	0.08%	40.45%	7.49%	-0.05%	-28.77%	-5.53%
Textiles, apparel, leather	0.31%	40.29%	5.81%	1.19%	35.88%	5.00%	-2.18%	-27.01%	-2.49%
Wood, furniture	0.02%	10.10%	4.74%	0.13%	7.84%	4.76%	-0.24%	-5.52%	-0.58%
Paper, printing, publishing	0.05%	12.23%	2.95%	0.06%	4.02%	4.59%	-0.25%	-7.55%	-0.42%
Chemical products	0.57%	17.68%	3.28%	0.22%	14.49%	4.45%	-1.03%	-10.81%	-2.20%
Non-metallic minerals	0.08%	15.53%	2.45%	0.48%	21.09%	4.42%	-0.77%	-7.20%	-1.49%
Primary and fabricated metals	0.12%	13.04%	2.09%	0.18%	11.58%	3.38%	-0.95%	-2.01%	-1.91%
Industrial machinery and equipment (including computers)	0.05%	4.79%	1.97%	0.30%	4.33%	3.07%	-0.51%	-1.77%	-1.18%
Electronic and other electrical equipment	0.56%	7.65%	1.88%	0.59%	6.27%	2.66%	-0.31%	-4.80%	-0.68%
Transport equipment	0.11%	16.02%	1.92%	0.19%	11.56%	2.41%	-0.17%	-15.26%	-1.39%
Other manufacturing	0.37%	10.66%	3.63%	0.75%	12.97%	3.91%	-0.08%	-3.07%	0.17%
Total	0.48%	24.27%	5.57%	0.41%	14.76%	3.01%	-0.93%	-12.55%	-1.91%
In millions of dollars									
Food, beverages, tobacco	59	107	76	12	44	7	-8	-245	-29
Textiles, apparel, leather	6	17	2	19	59	2	-94	-114	-9
Wood, furniture	0	0	0	1	12	1	-9	-20	-2
Paper, printing, publishing	4	31	24	4	6	16	-15	-119	-7
Chemical products	269	254	142	98	131	66	-467	-814	-188
Non-metallic minerals	6	13	2	6	13	1	-9	-21	-3
Primary and fabricated metals	9	9	10	8	13	9	-45	-87	-299
Industrial machinery and equipment (including computers)	6	10	4	92	125	57	-157	-274	-157
Electronic and other electrical equipment	23	19	14	64	38	522	-66	-129	-20
Transport equipment	7	21	4	47	153	30	-41	-766	-24
Other manufacturing	18	22	7	62	68	38	-6	-59	2
Total	407	503	285	413	662	749	-917	-2648	-736

Table 3 - Decomposition of results by source of shock

	All 3 shocks		Arms' length import tariff			Intermediates import tariff			Export tariff		
	Change in output (US $mil)	% change from base	Change in output (US $mil)	% change from base	Share of total	Change in output (US $mil)	% change from base	Share of total	Change in output (US $mil)	% change from base	Share of total
UK FDI in US											
Food, beverages, tobacco	59	0.30	-3	0.02	-5%	39	0.20	66%	23	0.12	39%
Textiles, apparel, leather	6	0.31	-1	-0.04	-13%	2	0.12	39%	5	0.23	74%
Wood, furniture	0	0.02	0	0.00	0%	0	0.01	50%	0	0.01	50%
Paper, printing, publishing	4	0.05	0	0.00	0%	1	0.01	20%	4	0.03	80%
Chemical products	269	0.57	-17	-0.04	-6%	190	0.40	70%	97	0.21	36%
Non-metallic minerals	6	0.08	-2	-0.02	-25%	2	0.03	38%	5	0.07	88%
Primary and fabricated metals	9	0.12	0	-0.01	-9%	7	0.09	82%	2	0.03	27%
Industrial machinery and equipment (including computers)	6	0.05	-2	-0.01	-33%	4	0.03	67%	4	0.03	67%
Electronic and other electrical equipment	23	0.56	0	-0.01	-2%	18	0.42	76%	6	0.14	25%
Transport equipment	9	0.11	-1	0.01	9%	3	0.04	36%	5	0.06	55%
Other manufacturing	18	0.37	-2	-0.03	-8%	10	0.20	54%	10	0.20	54%
Totals	**409**	**0.41**	**-28**		**-7%**	**276**		**67%**	**161**		**39%**
U.S. FDI in UK (Scenario I)											
Food, beverages, tobacco	12	0.08	-12	-0.08	-100%	3	0.02	25%	21	0.13	175%
Textiles, apparel, leather	19	1.19	-2	-0.13	-11%	2	0.15	13%	18	1.17	98%
Wood, furniture	1	0.13	0	-0.01	-8%	0	0.03	23%	1	0.11	85%
Paper, printing, publishing	4	0.06	-1	-0.01	-14%	4	0.07	100%	1	0.01	14%
Chemical products	98	0.22	-58	-0.13	-59%	69	0.15	70%	87	0.19	89%
Non-metallic minerals	6	0.48	0	-0.02	-4%	1	0.08	17%	5	0.42	88%
Primary and fabricated metals	9	0.18	-1	-0.02	-11%	6	0.13	68%	4	0.08	42%
Industrial machinery and equipment (including computers)	92	0.30	-13	-0.04	-19%	37	0.12	53%	46	0.15	66%
Electronic and other electrical equipment	64	0.59	-11	-0.11	-17%	62	0.58	97%	13	0.12	20%
Transport equipment	47	0.19	-4	-0.02	-9%	22	0.09	47%	29	0.12	62%
Other manufacturing	62	0.75	-18	-0.22	-30%	52	0.62	84%	28	0.34	46%
Totals	**414**	**0.27**	**-120**		**-31%**	**258**		**66%**	**253**		**65%**
Grand totals	**823**		**-148**		**-19%**	**534**		**67%**	**414**		**52%**

Table 4 Elasticities used in the simulations

Domestic supply	Import supply	Domestic demand	Substitution

Sector	min	max	midpoint	min	max	midpoint	min	max	midpoint	min	max	midpoint
Food, beverages, tobacco	0.20	1.20	***0.70***	2.00	10.00	***6.00***	-0.15	-1.00	***-0.58***	0.80	6.20	***3.50***
Textiles, apparel, leather	0.50	3.00	***1.75***	2.00	10.00	***6.00***	-0.28	-2.20	***-1.24***	2.20	8.80	***5.50***
Wood, furniture	0.16	0.38	***0.27***	2.00	10.00	***6.00***	-0.36	-1.80	***-1.08***	2.80	3.20	***3.00***
Paper, printing, publishing	0.16	0.38	***0.27***	2.00	10.00	***6.00***	-0.39	-1.20	***-0.80***	1.40	3.60	***2.50***
Chemical products	0.90	3.00	***1.95***	2.00	10.00	***6.00***	-0.39	-1.60	***-1.00***	1.40	6.00	***3.70***
Non-metallic minerals	0.30	3.00	***1.65***	2.00	10.00	***6.00***	-0.39	-1.60	***-1.00***	1.20	5.60	***3.40***
Primary and fabricated metals	0.33	1.30	***0.82***	2.00	10.00	***6.00***	-0.39	-2.00	***-1.20***	1.20	5.60	***3.40***
Industrial machinery and equipment (including computers)	0.50	2.40	***1.45***	2.00	10.00	***6.00***	-0.36	-2.40	***-1.38***	1.50	5.60	***3.55***
Electronic and other electrical equipment	0.50	2.40	***1.45***	2.00	10.00	***6.00***	-0.36	-2.40	***-1.38***	1.50	5.60	***3.55***
Transport equipment	0.50	1.20	***0.85***	2.00	10.00	***6.00***	-0.31	-2.50	***-1.41***	1.00	10.40	***5.70***
Other manufacturing	1.23	2.94	***2.09***	2.00	10.00	***6.00***	-0.36	-2.50	***-1.43***	2.00	5.60	***3.80***

Table 5 - Sensitivity of output estimates with respect to elasticities

	Percentage change in output					
	UK FDI in US			***U.S. FDI in UK (Scenario I)***		
	Minimum	Maximum	Evaluated at midpoint elasticities	Minimum	Maximum	Evaluated at midpoint elasticities
Food, beverages, tobacco	0.07	0.58	0.30	0.01	0.32	0.08
Textiles, apparel, leather	0.08	0.58	0.31	0.30	2.29	1.19
Wood, furniture	0.01	0.02	0.02	0.07	0.19	0.13
Paper, printing, publishing	0.03	0.08	0.05	0.03	0.11	0.06
Chemical products	0.20	0.95	0.57	0.07	0.43	0.22
Non-metallic minerals	0.02	0.17	0.08	0.10	0.90	0.48
Primary and fabricated metals	0.04	0.20	0.12	0.06	0.30	0.18
Industrial machinery and equipment (including computers)	0.01	0.08	0.05	0.09	0.51	0.30
Electronic and other electrical equipment	0.10	0.96	0.56	0.16	1.04	0.59
Transport equipment	0.04	0.24	0.11	0.07	0.30	0.19
Other manufacturing	0.17	0.55	0.31	0.26	1.21	0.75

Table 6 Concordance

Model sector	ISIC (STAN)	BEA - U.S. Direct Investment Abroad (USDIA)	BEA - Foreign Direct Investment in the United States (FDIUS)	HTS
Food, beverages, tobacco	31	Food and kindred products	Food	9,12-24
		Other/tobacco	Beverages and tobacco	
Textiles, apparel, leather	32	Other/textile products and apparel	Textiles, apparel, and leather products	41-43,50-65*
		Other/other/leather and leather products		
Wood, furniture	33	Other/lumber,wood,furniture and fixtures	Wood products	44,45,94
			Furniture and related products	
Paper, printing, publishing	34	Other/paper and allied products	Paper	47-49
		Other/printing and publishing	Printing and related support activities	
			Information/publishing industries	
Chemical products	35	Petroleum/petroleum and coal products	Petroleum and coal products	29-40
		Chemicals and allied products	Chemicals	
		Other/rubber products	Plastics and rubber products	
		Other/miscellaneous plastic products		
Non-metallic minerals	36	Other/glass products	Nonmetallic mineral products	68-70
		Other/stone, clay, and other nonmetallic mineral products		
Primary and fabricated metals	37, 381	Primary and fabricated metals	Primary and fabricated metals	72-83
Industrial machinery and equipment (including computers)	382	Industrial machinery and equipment	Machinery	8401-8406, 8410-8485
			Computers and electronic products/computer and peripheral equipment	
Electronic and other electrical equipment	383	Electronic and other electrical equipment	Computers and electronic products/communications equipment	85
			Computers and electronic products/audio and video equipment	
			Computers and electronic products/Semiconductors and other electronic components	
			Computers and electronic products/Magnetic and optical media	
			Electrical equipment, appliances, and components	
Transport equipment	384	Transport equipment	Transportation equipment	8407-09, 86-89
Other manufacturing	385, 39	Other/instruments and related products	Computers and electronic products/navigational, measuring, and other instruments	46 ,66, 67, 71, 90-93, 95-97*
		Other/other/miscellaneous manufacturing industries	Miscellaneous manufacturing	

*Applies to FDIUS. For USDIA, chapters 41-43 and 64 are moved from "textiles, apparel, leather" to "other manufacturing"