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Foreign Investment, Trade, and Industrial Performance:

A Review of Recent Literature

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The paper reviews “Are Canadian-Controlled Manufacturing Firms Less Productive Than Their Foreign-Controlled Counterparts?” by Someshwar Rao and Jianmin Tang and “The Long and the Short of the Canada-U.S. Free Trade Agreement,” by Dan Trefler for the Industry Canada Productivity Conference, September 29, 2000, Ottawa. The author is grateful for Keith Head’s helpful discussion and advice.

I. Introduction

Canada has tremendous exposure to the international marketplace. Foreign-controlled firms account for half of manufacturing sales in Canada, while roughly 40 percent of Canadian GDP is exported. Recent Canadian policies have removed impediments to both inward investment and imports. The 1988 Canada-U.S. Free Trade Agreement (FTA) eliminated tariffs with Canada's dominant trading partner. The dismantling of Canada's Foreign Investment Act in 1984 signalled a commitment to an open policy towards investment that was augmented by investment protection provisions in the FTA.

The two papers in this section take stock of the policies that have facilitated Canada's integration into the world economy. "The Long and the Short of the Canada-U.S. Free Trade Agreement," by Dan Trefler relates changes in various aspects of manufacturing performance including output, employment and productivity to tariff changes mandated by the FTA. His results suggest both long-term benefits and short-term pain from the Agreement. In "Are Canadian-Controlled Manufacturing Firms Less Productive Than Their Foreign-Controlled Counterparts?," Someshwar Rao and Jianmin Tang measure the difference in multi-factor productivity between foreign- and domestically controlled firms in Canada and investigate the source of the difference. The results of their study have implications regarding the welfare effects of open policies towards investment.

In this review, I will discuss the details of these papers in the context of the large literature on trade and investment liberalization. I will describe theoretical models that predict outcomes consistent with the results of the papers. I will also relate how the

papers employ data and techniques that advance the empirical literature. I will begin by discussing Trefler's paper in relation to the trade literature. Then I will proceed to discuss Rao and Tang analysis in the context of the foreign direct investment (FDI) literature. The final section will summarize the papers and their policy implications and identify areas of future research.

II. Effects of Trade Liberalization

"The Long and the Short of the Canada-U.S. Free Trade Agreement," by Dan Trefler investigates the effects of trade reductions that occurred *within* 213 four-digit SIC industries in Canada. He relates tariff reductions to changes in employment, output, the number of establishments, trade, and labour productivity. As Trefler states in his summary, he finds that FTA tariff cuts resulted in

(1) A reduction in manufacturing employment, output, and the number of establishments: For industries experiencing tariff cuts exceeding 8 percent (impacted industries), the reductions were estimated to be at least 12 percent. For manufacturing as a whole, the declines are fairly modest, less than 5 percent.

(2) An increase in labour productivity: 3.2 percent per year for highly impacted industries and 0.6 percent per year for all manufacturing.

(3) An increase in annual earnings of production workers: Tariff cuts raised production earnings by 0.8 percent and did not appear to affect non-production worker earnings.

(4) Increased trade with the United States: The tariff cuts explain almost of the increased trade with the U.S. for impacted industries. However industries whose trade increased the most had no tariffs with the U.S. in 1988.

Trefler's paper is strictly empirical and he does not discuss his results in the context of theory. In what follows, I will first explain how the techniques he employs isolate the effects of FTA tariff reductions and contributes to the empirical literature on

the FTA. Then I will provide a survey of the relevant trade literature and discuss his results in light of theory.

Trefler articulates the various problems of inferring FTA effects using aggregate data and time-series evidence. Foremost are the difficulties in determining that the FTA was the source of observed changes in manufacturing activity. Monetary policy, movements in the business cycle, exchange rate movements are confounding factors that may underlie changes in Canadian manufacturing. To identify FTA effects, the researcher must link differences in the degree to which industries are liberalized under the FTA to variation in industry performance.

Trefler points out how the use of aggregate data creates severe limitations for identifying FTA effects. First, while the tariff cuts may be substantial for the specific products for which they are applied, they will have much less variation when averaged across the large number of products that fall within a 2-digit industry. Trefler shows that almost 30 percent of 4-digit industries had tariffs against the U.S. of 10 percent or higher in 1988. If the data are aggregated to the 3-digit level, almost no industries had 10 percent tariff protection. Thus, the large variation across 4-digit industries in tariff reductions is largely obscured in more aggregated data.

A second problem with aggregated data is that the experience of large industries will be the driving force of variation in manufacturing performance within particular 2-digit industries. For example, the Motor Vehicle Industry is part of the 2-digit Transportation Industry and accounts for 40 percent of manufacturing output. This industry enjoyed free trade with the U.S. prior to FTA and changes in its performance should not be attributed to the FTA.

One valuable aspect of the Trebler paper is identifying FTA effects using variation in tariff changes that occurred within 213 4-digit industries. Another contribution is how he differences the data to control of secular, business cycle, and industry effects. First, he calculates an approximation of the annual compound growth rate of the variables of interest—output, employment, productivity, etc.—for each of for two periods. One period is the post-FTA period and the other is the pre-FTA period. He explains these two periods were quite similar in terms of the business cycle. Then he takes the difference in the growth rates of the two periods and relates these changes to FTA tariff cuts. His “differencing techniques” eliminate business cycle and industry-specific effects from confounding the analysis.

As I previously mentioned, Trebler’s paper does not position his results in the context of theory. His purpose is not to test theory but to provide a thorough accounting of FTA effects. However, as I will explain, his choice of focussing only on changes occurring *within* 4-digit industries restrict the scope of effects he is able to identify. The following survey of theory, therefore, serves two purposes. First, it complements Trebler’s empirical analysis by providing a theoretical backdrop useful for interpreting the results. Second, it identifies FTA effects that may not be detected in Trebler’s analysis.

II.A. Theories of trade liberalization and industry performance

I will begin with a brief description of traditional trade theory and discuss why it is unlikely to explain the results in Trebler’s paper. Then I will describe a number of “new trade” theories that provide a better framework for Trebler’s analysis. Trebler investigates the effects of tariff reductions on a large number of industry performance measures.

These include employment, earnings, output, trade, and labour productivity. I will confine my discussion to predictions that theory makes about the effects of trade liberalization on output and productivity.

The Ricardian model and the Heckscher-Ohlin theorem predict the expansion and contraction of specific industries in response to trade liberalization. The simple Ricardian model argues that differences across industries and nations in labour productivity determine the pattern of trade. Nations will export goods of industries for which they have a comparative advantage in production. The Heckscher-Ohlin theorem states that a country has a comparative advantage in goods that are relatively intensive in the country's relatively abundant factors. Again, countries will export goods for which they have a comparative advantage. These traditional models predict that the effects of trade liberalization on output will depend on comparative advantage: it will rise for goods for which a country has comparative advantage and fall for those where there is comparative disadvantage. Resources will move from comparatively disadvantaged industries to those that have comparative advantage. A central prediction of traditional trade theory is the *inter-industry* reallocation of resources.

It may be the case that the U.S. or Canada enjoys a comparative advantage across all goods within the manufacturing sector or that comparative advantage varies with manufacturing. If one country has a uniform advantage in the production of manufactures, then trade liberalization will either harm or hurt it in terms of output. On the other hand, if comparative advantage varies within manufacturing the effects of trade liberalization will be heterogeneous, depending both on the size of the tariff reduction as well as comparative advantage.

What implications does traditional trade theory have for the estimation strategy in the paper? If tariff reductions raise output for some industries and lower it for others within the manufacturing sector, estimating a single tariff effect is incorrect. Instead, the effect should be allowed to vary according to comparative advantage. The researcher would be required to interact the tariff variable with another variable indicating whether liberalization is harmful or beneficial to a particular industry.

Another feature of traditional trade theory is that, while it predicts higher aggregate productivity due to trade liberalization, it does not predict higher productivity *within* industries. Aggregate productivity gains occur when resources are reallocated to comparative advantage industries and away from industries with comparative disadvantage. Industry-level productivity gains need not occur.

I will now explain why Trefler's specification, while inconsistent with traditional trade theory, is a good one for modelling Canada-U.S. trade. First, traditional trade theory predicts that goods will be traded in a single direction and countries should not export and import the same goods. However, two-way trade characterizes North American manufacturing. The Grubel-Lloyd intra-industry trade index is calculated as two times the minimum of imports or exports divided by the sum of imports and exports. Thus, it equals zero for one-way trade and one when imports and exports are equal. Head and Ries (1997) show that this index for Canada-U.S. bilateral trade in 1987 exceeds .50 for 15 out of 22 two-digit industries. In addition to one-way trade not characterizing Canada-U.S. trade, there is scant evidence that shifts in resources across industries account for changes in industry performance as traditional trade theory predicts. Davis and

Haltiwanger (1998) report that less than 1 in 10 job reallocations reflect employment shifts across 4-digit industries.

In what follows I will describe a number of new trade models that could give rise to the within industry changes found by Trefler. Generally speaking, what distinguishes new trade models from the traditional trade models is their incorporating imperfect competition and increasing returns to scale. The first new trade model I will discuss is attributable to Krugman (1980) and contains the “home market effect” that implies that tariff reductions will increase manufacturing production of the large country. This theory, however, does not predict productivity changes. The Eastman-Sykolt hypothesis foresees that tariff reduction will improve productivity by forcing firms to increase scale of operations. Next, I will describe a very recent model of industries with heterogeneous firms developed in Melitz (1999) where liberalization increases industry-level production by forcing inefficient firms out of the market. Finally, I will discuss the trade and growth literature that explicitly models the relationship between total factor productivity growth and trade.¹

The Home Market Effect

A key insight of the monopolistic competition model developed in Krugman (1980) is that size confers an advantage: firms find it attractive to locate in the country with the larger number of consumers. An industry that hosts a disproportionate amount of firms due to its size advantage will run a trade surplus that is magnified by trade liberalization. Head and Ries (1999a) motivate their empirical analysis of the effects of

¹ Some of the trade and growth literature maintains traditional trade theory’s assumption of constant returns to scale. I will focus on theories that incorporate increasing returns and imperfect competition.

FTA tariff reductions based on the Krugman model's prediction of the effects of trade liberalization on unequally sized trading partners.

The Krugman model depicts manufacturing as characterized by increasing returns to scale, differentiated products, and free entry. Manufacturing firms are assumed to produce a unique variety and consumers wish to purchase each variety. The central prediction of the model is that the country with the relatively large share of demand will host the majority of firms and run a trade surplus in the monopolistic competition sector.² Trade is balanced by a constant-returns-to-scale sector (agriculture). Weder (1995) adapts the model to allow for balanced trade across monopolistic competitive industries. He shows that the country with a *relatively* large share of demand will be a net exporter.

The Krugman model predicts that Canadian manufacturing will contract under the FTA. With roughly 10 percent of North American demand, Canada would experience an exodus of firms due to trade liberalization. However, the adaptation of the model by Weder generates heterogeneous effects across manufacturing industries—those in Canada that are large relative to the Canadian average will increase net exports whereas small industries would shrink. The effects of trade liberalization would not be uniform; growth or contraction depends on whether the industry has a relative “demand” advantage. Trefler's result associating the FTA tariff cuts with reduced Canadian manufacturing output may be viewed as being broadly consistent with the initial formulation of the Krugman model.

While there is increasing returns to scale in the Krugman model that potentially admits increased productivity through increased scale, one “undesirable” feature of the

² Head, Mayer, and Ries (2000) show that this prediction also holds in a model where output is homogeneous and firms sell to segmented home and foreign markets.

model is that trade liberalization does not influence the scale of operations, only the number of firms. Therefore, it cannot account for the productivity increases Trefler detects. For this, I turn to tariff limit pricing, Melitz's model of heterogeneous firms, and the trade and growth literature.

Tariff limit pricing

The Eastman-Stykolt hypothesis argues that tariff protection allowed Canadian firms to maintain high prices and thereby contributed to excess entry in Canadian industries.³ Thus, before trade liberalization, the Canadian manufacturing economy contained too many firms operating at sub-optimal output levels, a characterization that was consistent with the data. The logic of the argument was that as tariff fell, concomitant reductions in prices would force exit and allow remaining firms to expand output and realize greater economies of scale.

Trade liberalization and tariff limit pricing can give rise to some of the results detected by Trefler. Average industry productivity would increase with the reduction of tariff protection with the greater improvements experienced by industries for which tariffs fell the most. A criticism of the tariff limit pricing model, however, is that prices are set to exclude imports. Thus the model is inconsistent with two-way trade. A very recent model of trade allows for two-way trade while explicitly addressing firm-level heterogeneity within industries.

Trade liberalization and heterogeneous firms

Melitz (1999) augments the Krugman monopolistic competition model to allow for heterogeneous firms. He assumes firms make irreversible investments to enter an industry that leads to firms with heterogeneous productivity levels existing in

equilibrium. Trade liberalization increases competition causing the least productive domestic firms to leave the industry. Moreover, increased market opportunities associated with trade liberalization encourage more domestic firms to enter the export market and expand scale. Thus, the model predicts the effect of trade liberalization will be heterogeneous—beneficial to productive firms but harmful to unproductive ones. Individual industries realize increases in productivity due to the exit of relatively inefficient firms and the expansion of efficient ones.

Trade and Growth

Traditional trade theory viewed technology as a basis for trade. The early work of Ricardo demonstrated the pattern and gains of trade in terms of productivity differences across countries. In Ricardo's model, trade will give rise to an aggregate *static* productivity gain as countries restructure production towards relatively productive activities. More recent theory incorporating increasing returns and imperfect competition reverses the direction of causality—trade can give rise to *sustained* technological progress and productivity growth.

Industry productivity in the Ricardian model is exogenous. Thus, this model cannot account for the productivity growth occurring within industries that Trefler detects. The literature on trade and growth focuses on how productivity growth is influenced by trade. As described in the survey article of Grossman and Helpman (1995), two leading contributors to the area, there are two primary types of technological progress modelled in this literature. First, progress created by learning by doing that is a by-product of production activities. Trade enhances productivity growth when it increases output and thereby accelerates knowledge creation. A second class of models in

³ The hypothesis is proposed in Eastman and Stykolt (1967) and formalized in Muller and Rawana (1990).

the literature views technological progress as occurring due to deliberate attempts by firms to create knowledge.

Grossman and Helpman explain how learning by doing will generate productivity gains that are enhanced when knowledge spills across firm boundaries and national borders. They discuss models that incorporate traditional trade theory's assumption of perfect competition and predict that trade may either accelerate or decelerate productivity and output growth. These models do not seem appropriate for depicting the affects of the FTA on Canadian manufacturing because they describe one-way trade and may even have the two countries specializing in the same good.

More appropriate models are of recent vintage where firms make deliberate efforts to create knowledge and imperfect competition allows them to recoup R&D expenditures required for innovation. One mechanism through which trade increases productivity is by giving producers access to imported intermediate inputs and increasing the incentive for firms to create these inputs. A second mechanism when knowledge spillovers are transmitted through trade. In models that incorporate intermediate inputs, trade either increases the range of available manufactured inputs (Ethier (1982)) or provides access to newly invented, state-of-the-art intermediates (Grossman and Helpman (1991a)). The case where trade transmits knowledge is developed in Grossman and Helpman (1991b).

Overall, the trade and growth literature predicts that trade can lead to both static and dynamic gains in productivity growth. Productivity growth will occur when the composition of industry is restructured towards high productivity industries. Moreover, growth can occur within individual industries. The models described above generally

investigate movements from autarky to free trade but one would expect tariff reductions would have similar effects to opening a country to trade. Thus, the models that generate greater technological advance for individual industries can provide the theoretical basis for Trefler's finding that FTA tariff reductions raised productivity with 4-digit manufacturing industries in Canada.

II.B The Empirical Literature

There have been a number of empirical studies investigating the relationship of trade or trade liberalization to output growth and technological advance in industries. By in large, this literature fails to consistently find that openness to trade or the volume of trade is associated with greater productivity growth within countries. Evidence on the effect of trade liberalization on industry-level productivity is also inconclusive.

One strand of this literature uses cross-country growth equations to estimate the association between trade and growth in total factor productivity. This literature uses growth accounting to relate growth in output to growth in factors with the residual serving as an estimate of total factor productivity. Measures of openness or trade are then added to test whether this residual can be explained by these variables. Levine and Renelt (1992) consider a number of different measures of trade policies for over 100 countries over the period 1960-1989 but fail to find a consistent relationship between openness and long-run growth. The industry-level analysis of Harrison and Revenga (1995) reveal a *negative* relationship between trade and productivity for U.S. 4-digit industry data over the period 1959 to 1984. On the positive side, the U.S. International Trade Commission (1997) finds that tariffs lower productivity and a high export to output ratio raises productivity in sector-level regressions for a sample of 13 OECD countries (including

Canada) for the period 1980-1991. The Economic Planning Advisory Commission of Australia (1996) also uses sectoral data for 14 OECD countries finds that a one percentage point cut in tariff rates raises total factor productivity by 3.4 percent over 19 years. They find that most of the effects occur a number of years after the tariff reduction. Frankel and Romer (1999) evaluate 150 countries in 1985 and employ instrumental variable techniques to show that trade has a large effect on income but the relationship is only moderately statistically significant.

Further support for the proposition that openness promotes productivity is found in studies examining research and development (R&D) spillovers between nations. Coe, Helpman, and Hoffmaister (1995) find that developing countries with high import to GNP ratio enjoy stronger R&D spillovers from developed countries.

Other research examining productivity in specifications other than growth equations include Tybout and Westbrook (1995) who examine productivity in Mexican plants for 1984 to 1990, a period when Mexico underwent significant trade liberalization. They find that average costs fell and productivity rose during the period and that there is weak evidence of a positive correlation between movements in these performance measures and the extent of liberalization.

Another set of papers relates trade liberalization to industry output, the scale of operations in industries, or employment. Head and Ries (1999b) examine the effects of tariff changes under FTA to the number of firms and average size of firms in 230 Canadian manufacturing industries for the period 1988 to 1994. We find that the results depend on whether the tariff reductions are Canadian or U.S.. U.S. tariff reductions led to a 9.8 percent increase in average plant size that was largely offset by the 8.5 percent

reduction caused by Canadian tariff cuts. These effects were larger for industries experiencing high levels of entry and exit. Head and Ries (1999a) consider the effects of tariff reductions on Canadian industry share of North American (U.S. and Canadian) output in 4-digit manufacturing industries. Like the Trefler paper, they consider a single measure of (bilateral) tariff changes as opposed to investigating effects for U.S. and Canadian tariff reductions separately.⁴ We find heterogeneous effects across industries. Canadian industries with relatively low Canadian demand or high natural resource intensity fared best. We interpret the results as reflecting improved access to a large market (low demand industries) or comparative advantage (natural resource intensity). Finally, Gaston and Trefler (1997) use 2-digit SIC data to relate employment changes to tariff changes and add the employment level of corresponding U.S. industries to control for industry-specific effects shared by North American manufacturers. They find marginally significant negative effects of tariff reductions on employment.

Other empirical papers reveal trade-stimulating effects of the Agreement. Schwanen (1993) divides industries according to whether they were liberalized under the FTA or not. He compares Canadian increases in trade for each group to the U.S. and to the rest of the world and finds that trade increased fastest for liberalized products destined for the United States. Thus, he concludes the FTA had trade-stimulating effects. Clausing (2000) uses very disaggregated U.S. import data (the ten-digit categories of the Harmonized Classification System) and relates the volume of imports to tariff rates to estimate the trade-creation effects of the FTA. She finds extremely large effects,

⁴ The defense for this modelling decision is the high degree of correlation between Canadian and U.S. tariff reductions under the FTA and consequential difficulties in distinguished separate effects.

concluding that the FTA was responsible for over one-half of the \$42 billion increase in U.S. imports from Canada over the 1989-1994 period.

Trefler's paper is a welcome addition to this empirical literature. His technique of differencing the data eliminates industry-specific and business cycle effects that may confound the analysis. He demonstrates that his results are robust to different specifications and sample periods. His finding that the FTA reduced employment and output in Canadian industries is consistent with a size disadvantage as predicted by the home market effect. The positive result on productivity adds to the growing body of evidence that tariff reduction enhance productivity within industries in developed countries. Rather than a measure of openness such as trade to output that is commonly used in the literature, Trefler's use of tariffs makes it easier to interpret that causality runs from openness to productivity rather than the reverse.

Trefler's decision to examine changes within 4-digit industries somewhat limits the scope of his findings. For example, his investigation would not reveal tariff changes that promote some manufacturing industries but harm other ones. He also does not measure advances in manufacturing productivity stemming from a restructuring of industry towards high productivity industries and away from unproductive ones.⁵ Nonetheless, even if his analysis does not reveal every effect of the Agreement, he identifies some very pronounced effects that imply that even somewhat moderate tariff reductions can have profound effects on industries. These results are clearly important for policy formation.

⁵ Trefler argues in his conclusion that the FTA caused "dramatically higher productivity in low-end manufactures and resource reallocation to high-end manufactures." He does not, however, provide strong evidence to support this statement. He associates high initial tariffs with low-end manufactures and

III. FDI and Productivity

“Are Canadian-Controlled Manufacturing Firms Less Productive Than Their Foreign Counterparts?” by Someshwar Rao and Jianmin Tang examines the relative productivity of foreign and Canadian-controlled firms in Canada. Using firm-level data generating 1810 observations over the 1985-1995 period, the authors report three sets of results. The initial results test whether foreign-controlled firms have significantly different factor productivity than domestically controlled firms in Canada based on estimates of a Cobb-Douglas production function that includes controls for firm characteristics. The second set of results uses the estimated coefficients to measure the amount of the productivity gap between foreign and domestically controlled firms that is attributable to labour quality, vintage, unionization, exporting, and firm size. The third set of results uses the estimates to ascertain the extent that the productivity gap is caused by differences in industry composition.

The results reveal that foreign-controlled firms are more productive than domestically controlled ones, although the gap of 25 percent in 1985-1988 narrowed to 16 percent during the 1989-1995 period. In addition, they find that productivity increases with labour quality as measured by the share of white-collar workers in total employment. The estimates also reveal that greater scale is associated with higher productivity but that unionization has a negative effect.

None of the aforementioned results are surprising. The result that higher foreign controlled firms are most productive has been found for both in Canada and the United States. The firm characteristics enter with signs that theory and common sense would

productivity rose the most in those sectors. However, he does not explicitly examine resource reallocation from high to low productivity sectors.

predict. What is striking about the findings is the magnitude of the foreign productivity advantage and that the controls for firms characteristics have negligible effects on this productivity gap. These results contrast with the earlier ones in Globerman, Ries, and Vertinsky (1994) who find that differences in size account for differences in labour productivity. The firms in the sample used in this study are mostly publicly traded with an average employment exceeding 3000. Thus, the Canadian sample does not include very small firms that one would expect to have low productivity. Nonetheless, these large Canadian firms have dramatically lower productivity.

In thinking about differences between the two types of firms that might give rise to the measured productivity gap, I thought that the foreign-owned firms might have a large amount of unmeasured, white-collar labour services provided by the foreign parent. As an unmeasured input, I anticipated that this might be a source of the difference in productivity. However, the paper's results prove this to be an incorrect conjecture. Foreign-controlled firms do have a lower white-collar share of employment that is consistent with some of these inputs coming from headquarters and not measured on the affiliate income statements. However, the positive and significant coefficient on the white-collar share of employment refutes the hypothesis that (measured) low white-collar shares in foreign affiliates is associated with greater productivity. Instead, the higher average white-collar share of domestically owned firms narrows the productivity gap.

The authors also put to rest the hypothesis that industry composition differences explain average productivity differences. While the paper shows major differences in the industry composition for foreign-controlled and domestically controlled firms, it turns out it is the Canadian firms that tend to concentrate in high productivity industries. Thus, if

the industry composition of the two groups were identical, the productivity gap would even be higher.

In the ensuing sections, I will briefly provide some theoretical background for the analysis. Then I will proceed to place the contribution of the paper in relation to the empirical literature and suggest further areas of inquiry.

III.A Theoretical Background

Most theories concerning FDI start with the premise that foreign firms possess some type of asset that enables them to compete with local firms despite unfamiliarity with consumers, distribution networks, language, business practices, etc. For example, the foreign firm may possess proprietary knowledge of a superior technology. In the international business literature, these assets are known as “ownership advantages.” Within the economic literature, Markusen (1995) considers “headquarter services” that can be supplied at low cost to foreign affiliates. Ownership advantages of low-cost headquarter services may enable a foreign affiliate to produce at lower costs than its domestically controlled counterparts. The Rao and Tang paper can be viewed as evidence in support of the proposition that multinationals possess production advantages vis-à-vis their domestic counterparts.

An important area of policy analysis concerns the contribution of foreign investment to growth. There are a variety of avenues through which FDI can contribute to growth. First, to the extent that it does not crowd out local investment one for one, it can add to the stock of capital and generate increased output. Second, investment by multinationals may provide more productive capital than that of domestically controlled manufacturers and contribute to growth that way. Finally, knowledge spillovers emitting

from foreign affiliates can increase productivity of domestically controlled firms. The Rao and Tang analysis does not address the questions of the extent that foreign investment crowds out domestic investment or whether high productivity of foreign affiliates spills over to domestically controlled manufacturing operations. However, their finding that foreign-controlled firms are more productive does indicate that foreign investment is a source of economic growth in Canada.

III.B Contributions to the Empirical Literature

Higher average productivity of foreign-controlled firms than domestically controlled firms has two explanations. First, it may be the case that within each industry, foreign affiliates outperform home firms. Alternatively, foreign-owned firms may disproportionately concentrate in high productivity industries. Indeed, seeking high returns, they may choose to enter only industries where productivity is high.

The study employs a data set that enables the researchers to distinguish these alternative explanations of high foreign affiliate productivity. Studies using cross sectional industry information relate variation in productivity to some measure of foreign affiliate activity in industries. A positive relationship is consistent with the hypothesis that foreign-controlled firms are more productive but may also reflect foreign affiliates choosing to enter industries where productivity is high. The firm-level data employed in this study makes it possible to distinguish between the alternative explanations of higher average productivity for foreign-controlled affiliates. The data allow the researchers to employ industry dummy variables that capture productivity differences across firms that are common to all firms in a given industry.

The results contained in Table 3 of their paper establish that foreign-controlled firms are more productive than domestically controlled firms. Since the specifications include controls for firm characteristics, these differences are not a consequence of difference in industry, size, and other firm characteristics. Thus, *within* industry, foreign-controlled firms are more productive. One should note, however, that Rao and Tang employ industry controls at a fairly high level of aggregation (roughly 2-digit SIC). Examples of 2-digit industries are Electrical Machinery and Transportation Equipment, each of which, of course, contains sub-industries with varying levels of productivity. Thus, their findings may partly reflect industry composition differences across sub-industries within 2-digit industries.

Few studies have access to data that allow measurement of productivity differences across firms within industries. Globerman, Ries, and Vertinsky (1994) have a sample of plants in 21 4-digit industries in Canada in 1986. Unlike the Rao and Tang study, Globerman, Ries, and Vertinsky do not have a measure of capital and thus cannot estimate multi-factor productivity. The two studies contain the common finding that foreign-controlled firms are more productive than domestically owned firms. However, unlike the recent study, Globerman, Vertinsky, and Ries find that the differences disappear once controls for size are employed.

Doms and Jensen (1998) examine a sample of 115,139 U.S. establishments of which 4,463 are foreign-controlled. Like the Rao and Tang study, they calculate factor productivity by fitting a Cobb-Douglas specification and calculating residuals. Their much greater number of observations enable them to fit regressions separately to 4-digit level industries. This is important since one expects that factor intensities may vary

across industries. Like the Canadian studies, they find that foreign-controlled firms are more productive than domestically controlled ones. They also find that that these differences persist even after controlling for industry, size, plant age, and state. The results of the Doms and Jensen study are highly complementary to those of Rao and Tang. Foreign-controlled firms have higher factor productivity than domestically controlled firms and the differences are not attributable to industry composition or differences in firm characteristics.

Doms and Jensen also examine the performance of U.S. plants owned by U.S. multinationals. They divide their sample into plants owned by U.S. multinationals, foreigners, large U.S. firms, and small U.S. firms. They find that among these four groupings, total factor productivity is highest for plants owned by U.S. multinationals. Thus, foreign-owned plants, while more productive than the average U.S. plants are actually less productive than plants owned by U.S. multinationals. This raises the question whether Rao and Tang would find a similar result if they had the data to identify Canadian domestic firms that were multinationals. One would expect that Canadian multinationals might have higher productivity than Canadian firms operating only in the Canadian market. However, whether Canadian multinationals perform as well as foreign multinationals is unclear. Presumably, the Rao and Tang foreign sample is dominated by U.S. ownership. If U.S. multinationals enjoy extremely high levels of productivity as suggested by the Doms and Jensen study, it will likely be the case that Canadian multinationals would not perform as well as affiliates of U.S. multinationals.

As stated previously, the infusion of productive foreign capital serves as a source of economic growth in host countries. Thus, the results of the Rao and Tang paper

establishing foreign-controlled companies as having relatively high productivity are complementary to papers identifying a link between FDI and overall productivity growth in the host country. Borensztein, De Gregorio, and Lee (1998) use a panel of 69 countries from 1970-1989 to investigate the role FDI plays in economic growth. They find that FDI promotes growth by increasing the capital stock as well as increasing overall factor productivity. However, the latter result depends on the host country having a threshold level of human capital in order to have sufficient ability to absorb new technology. Similar results are found in de Mello (1999) who examines 32 countries over the 1970-1990 period. He shows that FDI is most efficiency enhancing in host countries that are relatively technologically advanced. In countries focussing on individual host countries, Barrell and Pain (1997) find that FDI raised technical progress in West Germany and manufacturing in the United Kingdom. Finally, Gera, Gu, and Lee (1999) determine that FDI is associated with lower costs and higher productivity in Canada for the period 1973-1992.

Having established that foreign-controlled firms are more productive than domestically controlled firms, the next important issue is how this serves to benefit Canada. On the surface, one may question whether Canada gains by the presence of productive foreign-controlled firms. There would be little gain if the foreign owners “capture” surplus associated with high productivity in the form of excess profits. However, there are a number of mechanisms through which productive foreign firms may increase Canadian welfare. First, productive foreign-controlled firms can sell output at lower prices than their Canadian counterparts resulting in gains to consumers and firms that purchase intermediate inputs. Second, some of the surplus created may be paid to

workers in the form of higher wages. Finally, foreign-controlled firms may transmit knowledge to Canadian firms, making Canadian controlled firms more productive.

The empirical evidence on the benefits of productive foreign firms for host country welfare is limited. A number of studies show that foreign-controlled firms pay higher wages. The Globerman, Ries, and Vertinsky (1994) examination of establishments in 21 industries in Canada in 1986 reveals that foreign affiliates pay over 20 percent higher wages than do domestically owned firms. These differences, however, vanish when they control for capital intensity and firm size. Doms and Jensen's (1998) 1987 U.S. establishment-level data also shows that foreign affiliates pay 20 percent higher wages than their domestically owned counterparts. Moreover, these differences persist even after adding controls for plant size and age, industry, and state, with foreign affiliates paying on average 7 percent wage premiums. However, as with their productivity results, the differences are entirely due to the performance of U.S. plants that are not owned by U.S. multinationals. U.S. multinationals pay higher wages than their non-multinational counterparts as well as foreign-owned firms. Feliciano and Lipsey (1999), using a panel of U.S. industries in 1987 and 1992, provide somewhat different results than those of Doms and Jensen. They find that while average wages for foreign affiliates are higher than that of domestically owned firms, these differences disappear with the inclusion of controls for size and location. However, wage premia appear to be paid in foreign-owned non-manufacturing industries. The important result in all these studies is that foreign firms appear to pay higher wages. Even if the higher wages are associated with greater size and capital intensity, they still represent a gain to the host

economy. Thus, the empirical literature indicates that higher wages are a means through which the host economy gains from productive foreign-controlled firms.

Evidence of the effect of foreign-controlled firms on domestically controlled firm productivity is mixed. The result that productivity levels of domestically owned firms increase with the foreign affiliate share of the industry appears in Globerman (1979) for Canada and in Blomstrom (1986) for Mexico. Aitken and Harrison (1999) find a positive relationship between increased foreign equity participation and productivity in plants in Venezuela. However, an increase in foreign investment is associated with a decline in the productivity of domestically controlled plants.

Other studies provide indirect evidence of productivity spillovers. Aitken, Harrison, and Lipsey (1996) as well as Feliciano and Lipsey (1999) find that the wages paid in an industry by domestically owned firms in the United States rises with the share of foreign-controlled firms in the industry. One interpretation for this result is that foreign affiliates increase the productivity of domestically owned firms.

The Rao and Tang paper provides striking results. Among large, publicly traded companies in Canada, foreign-controlled firms were 16 percent more productive than their domestically owned counterparts in 1989-1995. While firm characteristics such as size, unionization, and labour quality matter for productivity, they do not influence the productivity gap. Moreover, if industry composition were the same for foreign-controlled and domestically owned firms, the gap would be even larger. These results are consistent with theory suggesting that foreign affiliates need be more productive to compete in foreign environments. The magnitude of the difference indicates that foreign-controlled firms may provide substantial welfare benefits to Canada.

V. Conclusions and Future Research

Both the Trefler and Rao and Tang papers provide useful information for policy formation. Canada has steadily removed barriers to trade and investment through participation in the World Trade Organization and the North American Free Trade Agreement. It is important to assess the consequences of greater international economic integration.

The subject of this conference is productivity with Canada's lagging performance as a backdrop. The evidence compiled in the Trefler and Rao and Tang paper indicate that neither tariff reductions under the FTA or the performance of foreign affiliates are to blame. Rather, productivity in Canada would have been lower if there were higher tariffs barriers between the U.S. and Canada or less foreign investment.

The analysis contained in the papers raises a couple of areas of where further inquiry may be valuable. With regard to the Trefler paper, the sizable productivity increases that occurred within 4-digit industries may be only part of the productivity story. The FTA may also have led to a shift of resources out of low productivity industries and into higher productivity industries. It would be useful to measure the extent that inter-industry shifts may have added to productivity increases attributable to the FTA. Trefler also suggests that the long-run winners from the FTA were the stakeholders of efficient establishments. Support for this contention requires investigating the effects of the FTA at the firm level. Such an investigation, of course, requires a different data set than that used by Trefler.

The Rao and Tang paper provides strong evidence that foreign-controlled firms are productive but does not investigate spillover benefits to workers and domestically

controlled firms. Investigation of possible spillover benefits would add to the analysis, although probably requiring more data than currently exists in the researchers' data set.

This review endeavoured to provide a survey of the theoretical literature specifying the linkages between openness to trade and foreign investment and industry performance. With this theory providing the framework, the empirical literature described in the paper investigates whether trade and FDI influence productivity and measures the magnitude of the effects. The Trefler and the Rao and Tang papers combine unique data and strong empirical techniques to provide valuable contributions to this area of inquiry.

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