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dissertation entitled

THREE ESSAYS ON INTERNATIONAL TRADE AND MULTINATIONAL FIRMS

presented by

NATHANIEL P.S. COOK

has been accepted towards fulfillment
of the requirements for the

Ph.D. degree in Economics

Steven J. Matt
Major Professor's Signature

June 8, 2007
Date

THREE ESSAYS ON INTERNATIONAL TRADE AND MULTINATIONAL FIRMS

By

Nathaniel P. S. Cook

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Economics

2007

ABSTRACT

THREE ESSAYS ON INTERNATIONAL TRADE AND MULTINATIONAL FIRMS

By

Nathaniel P. S. Cook

This dissertation consists of three essays exploring the effects of economic integration, trade policy, and tax policy on the location and production decisions of multinational firms. In particular, it investigates the motivations for a multinational firm to establish a foreign affiliate that not only makes local sales in the host country, but also exports to foreign markets, an activity known as export platform foreign direct investment (export platform FDI).

In recent years, exports by affiliates of US multinational firms have grown faster than local sales by those affiliates. US multinational firms are increasingly using foreign affiliates to not only serve the host country market, but also export to foreign markets. The first chapter of the dissertation, "Motivations for Export Platform FDI as a Strategy for Serving Foreign Markets," empirically investigates characteristics of countries that tend to attract export platform FDI. A significant contribution of this chapter is to emphasize the importance of understanding the motivations for export platform FDI as distinct from the motivations for FDI for local sales to the host country. The findings are that export platform FDI by affiliates of US multinational firms is more prevalent in countries have greater export market potential, as measured by the host country's proximity to other large markets, and are members of preferential trade agreements in which the US is not also a member.

The second chapter of the dissertation, "Using Trade Policy to Influence Firm Location," examines how one country's trade policy can affect another country's ability to attract FDI, and how, in the presence of economic integration in the form of a free trade area (FTA), governments can adjust their external trade policies to influence firm location. Interestingly, even if a country cannot itself attract FDI, its government can use trade policy to influence whether or not other countries are able to attract export platform FDI. A case is examined in which the formation of a FTA results in "FDI destruction," a multinational firm's decision to shut down an established foreign affiliate. The striking result is that this decision depends not only on the host country's policies, but also on the trade policies of other countries in the FTA.

The third chapter of the dissertation, "Preferential Trade Agreements and Tax Competition with Internationally Mobile Firms," extends existing models of international tax competition to incorporate the activities of multinational firms headquartered outside the competing regions. In the absence of a preferential trade agreement (PTA), governments use positive taxes to exercise market power over the profits that internationally mobile firms must receive to locate within their borders. That is, FDI by multinational firms is for local sales to the host country only, and foreign affiliates face positive taxes in the host country. However, when two identical countries form a PTA, tax competition drives equilibrium taxes to zero, as each country attempts to increase its tax base within the PTA at the expense of the other country's tax base. As a result, each country in the PTA attracts more FDI from the rest of the world than it otherwise would, and each affiliate serves as an export platform for the other country in the PTA.

ACKNOWLEDGEMENTS

Like so many things in economics, acknowledging the contributions of the many people who have helped me along the way presents a clear identification problem. Nevertheless, I am certain of my indebtedness to a number of people, whom I would like to acknowledge here.

First, I would like to thank Professor Steven J. Matusz for serving as my advisor since my first semester at Michigan State. I will never forget his first words of advice about my research, the very first time we met, which were something to the effect of, "First, you need to pass the Prelim. Then we can talk about your research interests." Right then I knew that Professor Matusz was precisely the sort of "straight-shooter" with whom I could successfully work. Professor Matusz's contributions have been too numerous to list, ranging from his insights regarding the technological implications of one of my regressors in an earlier version of the first chapter of this dissertation to his undeterred support in helping me work through some of the difficult theoretical issues in the third chapter. I greatly appreciate all that Professor Matusz has done for me.

Following the sage advice of Professor Matusz, I did pass the Prelim, at which point it was time to proceed to field courses. While I thought upon entering graduate school that my interests were in the field of international trade, it was Professor Jay Wilson's course on international trade theory that cemented my passion for the subject. From that point forward, Professor Wilson has been an important part of my development as an economist. His enthusiasm for this dissertation has been contagious, and his support throughout the entire process has been invaluable.

I trace my transition from student to scholar to Dr. Susan Zhu's course on Advanced Topics in International Trade. It was while writing a paper for that course that I first encountered the idea of export platform FDI, which serves as the unifying theme in this dissertation. Dr. Zhu's deep knowledge of the literature in international trade is impressive and inspiring, and her suggestions for my research have always greatly improved it. I thank Dr. Zhu for all of her help.

A number of other people have been extremely helpful along the way. If, as Professor Matusz suggested, the first step to successfully completing a dissertation is passing the Prelim, then I owe a great debt to my classmate Chris Douglas. The many hours that we spent studying together in Marshall Hall certainly paid off. Patrice Whitely served as a constant sounding board for both my ideas and my frustrations regarding my research, and without that, I don't think this dissertation would have been possible.

I would also like to thank Professor Srinivas Talluri for serving on my dissertation committee, Professor Jeff Wooldridge for his help with my questions regarding sample selection corrections, Professor Carl Davidson and Dr. Mike Conlin for their insightful questions and suggestions during seminar presentations of portions of my research, and Jennifer Carducci for her continuing support in navigating the program and its requirements.

Finally, none of this would have been possible without the unconditional love and support of my parents Jan and Phil Cook, my grandfather Donald Bulthaup, and my loving wife Sarah.

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INTRODUCTION

Multinational firms are the primary actors in contemporary international trade. Recent research by Bernard et al. (2005) shows that "roughly 90 percent of US exports and imports...flow through multinational firms" (17), and the share of trade conducted by multinational firms is increasing through time. To understand contemporary international trade, one must understand the activities of multinational firms.

Trade economists have long acknowledged this fact, and a large literature on the activities of multinational firms has emerged in the field of international trade. Initial efforts to model the behavior of multinational firms focused on bilateral (two-country) models. Given a firm located in one country, and consumers located in another country, how should the firm get its product to consumers? One option is to produce in the firm's "home" country and export to consumers in the other country. An alternative is to establish a foreign affiliate (FDI) in the "host" country where consumers are located.

This export-versus-FDI conception of the activities of multinational firms provides many important insights into the various motivations for firms to become multinational. Two categories of motivations for firms to become multinational are horizontal and vertical. Markusen (1984) and Markusen and Venables (2004) model a firm's decision to engage in horizontal FDI as a function of (among other factors) trade costs and the fixed costs of FDI. The higher the trade costs associated with exporting to a foreign country, and the lower the fixed costs associated with establishing a foreign affiliate, the more likely a firm is to become multinational. Helpman (1984) and Helpman and Krugman (1985) model a firm's decision to engage in vertical FDI as a function of

factor endowments in the home and host countries and factor input requirements of different production processes. If a firm is currently locating a production process that intensively requires a particular factor of production in a country in which that factor is relatively scarce (and therefore expensive), the firm may have incentive to relocate that production process to a country in which that factor is relatively abundant (and therefore cheaper).

While horizontal and vertical motivations for FDI provide valuable insights into the activities of multinational firms, more recent research has explored the limitations of bilateral models of multinational firms. In particular, treating the export-versus-FDI decision faced by firms as a bilateral decision implicitly assumes that a firm's decision regarding how to serve consumers in one country is independent of the firm's decision regarding how to serve consumers in other countries, which is unlikely to be very realistic.

An important activity of multinational firms that is overlooked by bilateral models is an activity known as export platform FDI. Export platform FDI occurs when a firm located in one country establishes a foreign affiliate in another country (FDI) that not only makes sales to the host country, but also exports its products from the host country to other countries. Data from the US Department of Commerce Bureau of Economic Analysis (BEA) show that in recent years more than one-quarter of the sales of majority-owned affiliates of US multinational firms are exports from the host country to countries other than the US and that the share of exports of foreign affiliates as a share of total sales by affiliates is growing. Thus, just as it was important for trade economists to understand the activities of multinational firms to understand international trade, it is now important

to understand the motivations for and implications of export platform FDI as an important and increasingly prevalent activity of multinational firms. This is the motivation for the research in this dissertation.

The first chapter of the dissertation, "Motivations for Export Platform FDI as a Strategy for Serving Foreign Markets," empirically investigates characteristics of countries that tend to attract export platform FDI. Empirical research investigating the degree to which FDI is horizontal versus vertical has settled on a set of "standard" characteristics that tend to be associated with FDI. Hanson et al. (2001) find that this standard set of characteristics motivates sales by affiliates to the host country ("local sales") differently than it motivates exports by affiliates from the host country. This suggests that the motivations for export platform FDI are different from the motivations for FDI for local sales. Following Hanson et al. (2001), I investigate which characteristics of host countries tend to motivate affiliate exports and affiliate local sales differently. Not only do I include the standard set of characteristics identified previously in the literature, but also I include two "non-standard" motivations for export platform FDI: host country export market potential and host country membership in exclusive preferential trade agreements. The hypotheses are that the closer a host country is to other large markets, the more export platform FDI it will attract, and if exports from the host country to certain other countries face low (or zero) tariffs as a result of the host country's membership in an exclusive preferential trade agreement, the more export platform FDI it will attract. These two potential motivations for export platform FDI would logically not appear among a set of characteristics designed to investigate the motivations for bilateral export-versus-FDI activities of multinational firms.

I find that both a host country's export market potential and host country membership in exclusive preferential trade agreements encourage affiliate exports more strongly than local sales by affiliates. These results are robust to the inclusion of a sample selection correction for host countries in which affiliate activity is (essentially) zero. This chapter provides empirical evidence that there are important motivations for export platform FDI that are overlooked by research that treats the activities of multinational firms as a bilateral export-versus-FDI decision.

The result from the first chapter that host country membership in exclusive preferential trade agreements tends to encourage export platform FDI is examined further in the second chapter. A paper by Raff (2004) makes the important observation that countries may adjust their tax and trade policies in response to a decision to engage in a preferential trade agreement. The second chapter of the dissertation, "Using Trade Policy to Influence Firm Location" investigates a specific case of such behavior. A monopoly firm located in one country is attempting how to get its product to consumers in two foreign countries. The two foreign countries differ in the cost of producing the good produced by the monopoly firm. In particular, the cost of production in one country (the high-cost country) is sufficiently high that the firm will never find it profitable to locate FDI in that country. Thus, the firm will either export to the high-cost country from its home country, or it will establish export platform FDI in the other (low-cost) country. Because of the firm's monopoly power, the high-cost country wants to levy a tariff on imports from either the firm's home country or the low-cost country. In the absence of a free trade agreement between the high-cost country and the low-cost country, the firm

may establish export platform FDI in the low-cost country, and exports from the low-cost country to the high-cost country will face a positive tariff.

However, if the high cost country and the low cost country integrate in the form of a free trade area (FTA), the high-cost country will not be able to levy a tariff on imports from the low-cost country. Thus, the high cost country may prefer to lower its tariff rate on imports from the firm's home country in order to encourage the firm not to engage in export platform FDI in the low-cost country. If the high cost country is successful, it causes "FDI destruction." That is, the firm would establish export platform FDI in the low-cost country in the absence of a FTA, but when the two countries form a FTA, the firm finds it more profitable to export to both countries than to establish export platform FDI in the low-cost country. In this way, the high-cost country, which cannot itself attract FDI, has considerable influence, through its trade policy, on whether or not the low-cost country is able to attract export platform FDI.

This result illustrates once again the importance of thinking beyond bilateral conceptions of the activities of multinational firms. FDI destruction occurs in the model in the second chapter not because a FTA makes export platform FDI in the low-cost country less attractive, but because in response to the FTA, a third country (the high-cost country) adjusts its trade policy to make exporting more attractive.

The third chapter of the dissertation, "Preferential Trade Agreements and Tax Competition with Internationally Mobile Firms" moves beyond the partial equilibrium model in the second chapter and considers a general equilibrium model of tax competition between two countries competing for internationally mobile firms from the rest of the world. Standard models of international tax competition assume that countries

compete for a fixed supply of capital located within the competing countries. Empirical evidence presented by Devereux et al. (2002) does not support the standard models of tax competition. In particular, they suggest that countries may compete not only for capital inside the competing regions, but also for internationally mobile capital from outside the competing regions.

I model two identical countries with a fixed number of domestic firms that produce varieties of a differentiated final good and earn positive economic profits. Internationally mobile firms from the rest of the world may prefer to locate in one of the two countries if profits in those countries are higher than profits available in the rest of the world. In the absence of trade in the final good, each country uses positive taxes to exercise market power over the returns that internationally mobile firms require to locate in the country. Because there is no trade in the final good, each internationally mobile firm that locates in one of the two countries serves only consumers in that country.

However, when the two countries form a preferential trade agreement (PTA) in which the final good is traded freely between the two countries, each internationally mobile firm in each country serves as an export platform, selling not only to consumers in the host country, but also to consumers in the other country. As a result, each country has an incentive to lower its tax slightly below the tax in the other country, since doing so would not affect the number of varieties of the final good available to domestic consumers, but by increasing its tax base, would increase the incomes that domestic consumers have to spend on the final good. Since both countries have the same incentive, tax competition drives the equilibrium taxes of both countries to zero, as each country tries to increase its tax base at the other country's expense. Relative to the equilibrium

with no trade in the final good, each country now attracts more internationally mobile firms from the rest of the world, and each firm serves as an export platform.

Taken together, the three chapters of this dissertation illustrate some of the reasons why it is important to consider export platform FDI as distinct from the traditional exports-versus-FDI conception of the activities of multinational firms. The first chapter shows that export platform FDI is motivated by different factors than FDI for local sales, in particular, the host country's relationships (both geographical and political) to other countries. The second chapter illustrates how the trade policies of other countries affect a country's ability to attract FDI. Specifically, a country that cannot itself attract FDI may be able, through its trade policy, to affect whether or not another country is able to attract export platform FDI. The third chapter extends traditional models of international tax competition by introducing competition for internationally mobile firms from outside the competing countries. In the presence of trade in the final good between the competing countries, each internationally mobile firm serves as an export platform, which exacerbates tax competition between the competing regions, and generates inefficiently low equilibrium taxes.

CHAPTER ONE: MOTIVATIONS FOR EXPORT PLATFORM FDI AS A STRATEGY FOR SERVING FOREIGN MARKETS

1. Introduction

In the past two decades, a large literature on foreign direct investment (FDI) has emerged in the field of international trade. An important research agenda in this literature has been to identify where multinational firms choose to locate their foreign affiliates and why. Standard explanations include host country market access, tariff jumping, and factor price differences (e.g. Brainard, 1997; Carr et al., 2001; Hanson et al., 2001; Hanson et al., 2003; Yeaple, 2003). Hanson et al. (2001) provide preliminary evidence that existing research on the locational determinants of FDI has overlooked important differences in the destination markets for affiliate sales. In particular, they argue that an important expansion strategy of multinational firms is to establish a foreign affiliate that not only makes local sales to the host country, but also exports its output to other countries, an activity known as export platform FDI.

US multinational firms' use of export platform FDI to serve foreign markets has increased in recent years. This is evident in a dataset from the Bureau of Economic Analysis (BEA). As shown in Table 1.1, non-US bound affiliate exports constitute a substantial share of total affiliate sales in most industries, especially manufacturing industries and wholesale trade. From 1999 to 2002, the value of exports by majority-owned affiliates of US multinational firms to countries other than the US increased in all

13 BEA industry categories. In 1999, non-US bound affiliate exports accounted for more than one-fifth of total affiliate sales; by 2002, that number had eclipsed one-quarter.

This increasingly prevalent form of FDI merits further investigation. In this chapter, I empirically investigate the motivations for export platform FDI as a strategy for serving foreign markets. Hanson et. al (2001) showed how local sales by majority-owned foreign affiliates of multinational firms and exports by those affiliates of are motivated differently by the standard country and industry characteristics thought to attract FDI. My approach differs from theirs in several important ways. First, whereas they aggregate affiliate exports to the US and affiliate exports to countries other than the US, I focus my attention only on non-US bound affiliate exports, since I am interested in export platform FDI as a strategy for serving foreign markets. Second, whereas they look at a standard set of country and industry characteristics thought to attract FDI, the central focus of my analysis is to determine whether two nonstandard motivations, host country export market potential and exclusive preferential trade agreement membership, encourage export platform FDI. The main findings are that US export platform FDI is more prevalent in countries that are smaller, have greater export market potential, and are members of preferential trade agreements in which the US is not also a member. Additionally, whereas host country preferential trade arrangement membership appears to encourage many different types of FDI, host country export market potential uniquely encourages export platform FDI.

This chapter is organized as follows. In section 2, I review some of the related research on multinational firms' decisions to invest abroad to identify the standard motivations for FDI and then describe two potential nonstandard motivations for export

platform FDI. In sections 3 and 4, I describe my estimation approach and the data employed in the estimation. My estimation results are reported and discussed in section 5. Section 6 concludes.

2. Motivations for Export Platform FDI

In this section, I identify motivations for export platform FDI. First, I briefly review some of the related research on multinational firms' decisions to invest abroad to identify the standard motivations for FDI. Then, I describe two potential nonstandard motivations for export platform FDI.

The existing literature on the locational determinants of FDI has attempted to identify characteristics of host countries that tend to attract FDI. Theoretical work on this question has produced two categories of possible motivations for firms to invest abroad: horizontal FDI and vertical FDI.

Horizontal FDI is motivated by "market access." When deciding how to serve a foreign market, a multinational firm faces a choice between (among other options) exporting to that market and establishing a foreign affiliate in that market (FDI). The advantages of exporting include taking advantage of plant-level economies of scale and avoiding the fixed costs of establishing a foreign affiliate in the destination market. On the other hand, by establishing a foreign affiliate, the firm can avoid trade costs, such as tariffs and transportation costs. Thus, when trade costs are high relative to the magnitude of plant-level scale economies and fixed costs, firms will tend to choose FDI over

exports. These ideas are modeled in Markusen (1984) and Markusen and Venables (2000).

Vertical FDI is motivated by factor price differences. If a firm is currently locating a production process that intensively requires a particular factor of production (e.g. labor) in a country in which that input is relatively expensive, there may be an incentive to relocate that production process to a country in which the price of that factor is relatively low. These ideas are modeled in Helpman (1984) and Helpman and Krugman (1985).

Empirical research has generally concluded that most FDI is horizontal[1]. In the seminal paper on the topic, Brainard (1997) finds that the share of total US sales to a country accounted for by exports (as opposed to sales by local affiliates of US multinational firms) is decreasing in trade costs and increasing in plant-level scale economies, evidence of horizontal FDI.

Carr, Markusen, and Maskus (2001) find that sales by affiliates in a host country are increasing in host country GDP, decreasing in the squared difference between home and host country GDP, and increasing in trade costs, all evidence of horizontal FDI. However, they also find that affiliate sales increase with the difference between the home and host country share of skilled laborers in the labor force, evidence of vertical FDI.

Hanson et al. (2001) suggest that vertical FDI may be more prevalent than previous research had indicated. Their panel dataset allows them to look at changes in the patterns of FDI across years. While they don't run a regression to examine this particular issue, they do note that the patterns of FDI in the 1980s and 1990s exhibit stark differences. In the 1980s, they find a trend toward concentration of US FDI in other

[1] For an excellent survey of the empirical literature, see Blonigen (2005).

OECD countries, suggesting horizontal FDI. In the 1990s, however, they find rapid growth in the non-OECD share of affiliate employment, suggesting a move toward vertical FDI. Furthermore, they find that in their entire sample (1982-1998), growth rates in the capital stock of manufacturing affiliates in OECD countries outpace growth rates in employment, whereas in non-OECD countries, employment growth exceeds capital-stock growth. These trends suggest the existence of both horizontal and vertical FDI.

Yeaple (2003) investigates the relative importance of horizontal and vertical motivations for FDI. He uses cross-sectional data to regress total sales of US multinational affiliates on horizontal FDI variables, such as tariff levels, FDP, and plant- and corporate-level scale economies (as in Brainard, 1997), and vertical FDI variables, such as a country's average level of schooling per worker, the skill-intensity of each industry, and the interaction between the two, establishing a "chain of comparative advantage" (Yeaple 2003, 728). To assess the relative importance of horizontal versus vertical motivations for FDI, after estimating the coefficients for his full model, he alternately restricts the coefficients on each set of variables (horiztontal and vertical) to be equal to zero and looks at the change in the R-squared of his regression. Using these approach, Yeaple finds that both horizontal and vertical motivations for FDI play a role in explaining the pattern of FDi, but that horizontal motivations seem to be relatively more important.

Hanson et al. (2003) examine evidence for vertical FDI in a different way. Instead of looking at sales of affiliates of US multinational firms, they look at the affiliates' demand for imported inputs for further processing. They find that affiliate demand for imported inputs is negatively correlated with wages for less-skilled labor (evidence of

vertical FDI) and positively correlated with a measure of market size (evidence of horizontal FDI). They also find that affiliate demand for imported inputs is negatively correlated with trade costs, which emphasizes the important point that high tariffs are not only a hurdle to be jumped by horizontal FDI, but may also be a disincentive for vertical FDI if the production process being conducted by the foreign affiliate requires imported inputs for further processing.

Two points are to be taken from this examination of existing literature on the determinants of FDI. First, looking at these various empirical studies of FDI, a fairly consistent set of regressors emerges. This "standard" set of country characteristics thought to be associated with FDI includes measures of host market size (usually GDP), average income (per capita GDP), trade costs (tariffs and/or transportation costs, sometimes proxied for by distance between the home and host countries), factor prices/endowments (usually proxied for by per capita GDP and/or average education), and control variables such as corporate income tax rates and geographic measures (distance between the home and host countries and/or an adjacency dummy variable). While not all of these regressors are found in all of the papers discussed, most of them will be found in any particular study. These regressors will certainly be relevant to the present inquiry, but if we want to understand what makes export platform FDI distinct, we need to think beyond these standard motivations for FDI.

Second, while the existing research focuses on identifying whether multinational firms use FDI for primarily horizontal or vertical motivations, Hanson et al. (2001), who find evidence of both horizontal and vertical motivations for FDI, write, "our findings suggest that the literature's benchmark distinction between horizontal and vertical foreign

direct investment does not capture the range of strategies that multinationals use" (249). In particular, it is not clear that export platform FDI fits neatly into either the horizontal or vertical classifications. Further, Hanson et. al find that the "standard" motivations for FDI identified previously in the literature have statistically significantly different impacts on local sales by affiliates to the host country, and on affiliate exports to countries other than the host country (export platform FDI). That is, there is something about export platform FDI that is different from FDI for local sales, the standard theoretical construct in models of both horizontal and vertical FDI.

The central purpose of this chapter is to investigate two potential "nonstandard" motivations for export platform FDI. In particular, I apply the concept of market access to the specific case of export platform FDI. In existing studies of the determinants of FDI, market size (GDP) is consistently found to be among the most important motivations for FDI. By analogy, I consider in this chapter whether a measure of the *export* market size of a host country is an important motivation for *export platform* FDI. The measure of export market size that I use is the natural log of the inverse distance-weighted sum of other countries' market size, similar to the measure of market potential introduced by Harris (1954). Harris-type measures of market potential have previously been used in the international trade literature to explain regional productivity differences (Davis and Weinstein, 2001). In Head and Mayer (2003), a regional Harris market potential variable was found to be significant and positively correlated with the location choice of Japanese affiliates in the European Union. Additional evidence for the possibility that export market potential matters for FDI is provided by Blonigen et al. (2004), who find that the more FDI there is in neighboring countries, the less FDI a host country attracts, but the

larger the markets of neighboring countries, the more FDI a host country attracts. Baltagi et al. (2005) employ a similar spatial econometric approach, but find less evidence for export platform FDI, and more evidence for vertical and "complex vertical" FDI.

In applying the concept of market access to export platform FDI, it may not only be geographical relationships between countries that matter. Political relationships, embodied in preferential trade agreements, may also be relevant. Thus, I also consider in this chapter whether host country membership in an exclusive preferential trade agreement is a motivation for export platform FDI. Just as trade barriers may encourage horizontal FDI (the tariff-jumping motive), a country's membership in a preferential trade arrangement may encourage export platform FDI by firms headquartered in non-member countries. In a theoretical paper, Motta and Norman (1996) present a model in which regional economic integration leads to increased export platform FDI within the region by extra-regional firms. Neary (2002) presents a model in which the formation of an economic union (for example, the European Union) may encourage non-union firms to establish a single export platform within the union, but discourage multi-plant investment. Eckholm et al. (2003) identify conditions under which the formation of a free trade area between a high cost country and a low cost country encourages export platform FDI in the low cost country. Raff (2004) also identifies conditions under which economic integration causes "FDI creation" (induces firms located outside the integrating countries to engage in FDI when they would have served the same countries with exports in the absence of integration). Empirically, Shatz (2004) finds that a binary variable indicating membership in Mercosur (a preferential trade agreement in South America) is significant

and positively correlated with the share of affiliate exports in total affiliate sales from developing countries.

3. Empirical Specification

To test the hypothesis that export market potential and preferential trade agreement membership encourage export platform FDI, I will regress a measure of export platform activity in a country on measures of these two "nonstandard" motivations for export platform FDI, as well as the "standard" motivations for FDI. Before describing the full specification of my econometric model, I will explain the particular dependent variable employed.

An appropriate measure of export platform activity is important for my analysis. Hanson et. al (2001) use the log-difference between affiliate exports and affiliate local sales, which allows them to identify the factors that influence exports and local sales differently. However, they do not distinguish between affiliate exports back to the US and affiliate exports to countries other than the US. Shatz (2004) makes this distinction, and runs separate regressions using the share of "vertical" exports back to the US in total affiliate sales and the share of "horizontal" exports to countries other than the US in total affiliate sales as dependent variables. He finds "striking differences" between the results from the vertical and horizontal regressions, which suggests that the aggregation in Hanson et al. (2001) is not appropriate for the present inquiry. Following Hanson et al. (2001), but mindful of the results in Shatz (2004), the measure of export platform FDI that I employ is $EXLS_{ijt} = AEX_{ijt} - ALS_{ijt}$ where i, j, and t index coutries, industries and

years, respectively. AEX_{ijt} is the natural log of non-US bound exports from country i by majority-owned industry j affiliates of US multinational firms in year t in millions of US dollars. Similarly, ALS_{ijt} is the natrial log of local sales in country i by majority-owned industry j affiliates of US multinational firms in year t in millions of US dollars. This measure of export platform activity will allow me to identify the factors that influence non-US bound affiliate exports and local sales differently.

The specification of my econometric model is as follows:

$$EXLS_{ijt} = \beta_0 + \beta_1 \cdot POTENTIAL_{it} + \beta_2 \cdot PTA_{it} + \beta_3 \cdot GDP_{it} + \beta_4 \cdot PCGDP_{it} + \beta_5 \cdot DISTANCE_i + \beta_6 \cdot TARIFF_{it} + \beta_7 \cdot TAX_{it} + \beta_8 \cdot LABOR_{it} + Z\delta + u_{ijt}$$

The regressors *POTENTIAL* and *PTA* are the central focus of my analysis. *POTENTIAL* is the Harris-type measure of export market potential mentioned previously. I constructed *POTENTIAL* as follows:

$$POTENTIAL_{it} = \sum_{k \neq i} \left(\frac{GDP_{kt}}{dist_{ik}} \right)$$

where GDP_{kt} is the purchasing power parity (PPP) value of country k's Gross Domestic Product (GDP) in billions of US dollars in year t and $dist_{ik}$ is the distance in kilometers from country i to country k. If export platform FDI is motivated by a host country's proximity to large export markets, then the estimated coefficient on *POTENTIAL* should be positive and statistically significant. *PTA* is a binary variable that takes on a value of one if the country is a member of a preferential trade agreement in which the US is not also a member, and takes on a value of zero otherwise. If export platform FDI is motivated by a host country's membership in exclusive preferential trade agreements, then the estimated coefficient on *PTA* should be positive and statistically significant.

The next four regressors are my measures of some of the standard motivations for FDI identified in the previous literature on the determinants of FDI location. *GDP* is the natural log of the PPP value of the host country's GDP in billions of US dollars. *PCGDP* is the PPP value of the host country's per capita GDP. *DISTANCE* is the natural log of the distance in kilometers from the US to the host country. *TARIFF* is the unweighted average tariff rate of the host country.

The next two regressors require a brief explanation. Previous empirical literature looking at motivations for FDI has employed very rough measures of affiliate costs. For example, because actual wage data is difficult to obtain, labor costs/endowments have often been proxied for by per capita GDP or the average education level in the host country, which are likely to be very poor measures of the actual labor costs faced by affiliates of multinational firms. In other cases, even when data are readily available, such as statutory corporate income tax rates, these data may not accurately reflect the true cost to affiliates, as multinational firms often take advantage of tax incentives provided by host countries (UNCTAD 2000). For my analysis, I use measures of affiliate costs as reported by the multinational firms themselves. *TAX* is a measure of the foreign tax liabilities of affiliates; it is calculated as the value of foreign income taxes paid by affiliates divided by the value of total affiliate sales. *LABOR* is a measure of the labor costs incurred by affiliates; it is calculated by dividing the value of employee compensation by the number of employees. These measures of affiliate costs should be much more accurate than the measures of affiliate tax and labor costs used in the existing literature.

Finally, Z is a vector of dummies included as controls. A full set of dummy variables for industries and years is included in all regressions. The inclusion of the full set of industry dummies controls for any potential time-constant industry-level fixed effects (Wooldridge 2002).

4. Data

A substantial portion of the data used in the analysis comes from the US Department of Commerce Bureau of Economic Analysis (BEA). For the first time in 1982 and then every fifth year beginning in 1989, the BEA conducted mandatory benchmark surveys of US direct investment abroad. In 1999, the BEA implemented two important changes to the survey. First, they redefined the industry categories they employ in the presentation of their data. Second, they included, for the first time, estimates for affiliates that are exempt from mandatory reporting, greatly expanding the volume of foreign direct investment activity covered by the survey. Although the benchmark surveys are only conducted every five years, sample surveys are conducted in interim years, yielding annual data on the direct investment activities of US multinational firms.

For my empirical analysis, I use data on FDI activity in 12 BEA industry categories (all of the categories introduced in 1999 excluding "Utilities," for which there are virtually no observations of export platform FDI, and the residual "Other Industries") in 55 countries from 1999 to 2002. Summary statistics for my dependent and explanatory variables are presented in Table 1.2. I restrict my attention to majority-owned affiliates of

US multinational firms. Because of the BEA's reporting requirements, the most widely available data are for majority-owned affiliates.

Country-level data not obtained from the BEA come from various sources. Data on the PPP value of host country GDP and per capita GDP were obtained from the International Monetary Fund (IMF) World Economic Outlook Database. Unweighted average tariff rates were obtained from the World Bank. The binary variable PTA was constructed from other sources. Finally, data on bilateral distances between countries were obtained from the Centre d'Etudes Prospectives et d'Information Internationales (CEPII).

5. Results

In this section I describe the results of my empirical analysis. First, I report the results from the ordinary least squares estimation of my baseline specification described in section 3. Then, I show that these results are robust to potential sample selection bias. Finally, I investigate whether a host country's export market potential and membership in exclusive preferential trade agreements are motivations for FDI in general, or whether these matter only for export platform FDI.

I first estimated the baseline regression specification described in section 3 by ordinary least squares (OLS). I calculated heteroskedasticity-robust standard errors to allow for arbitrary correlation between observations of the same country, but treating observations of different countries as independent. Table 1.3 reports the results from this estimation.

Looking at the estimation results in Table 1.3, there is strong evidence for my hypothesis that a host country's export market potential and membership in an exclusive preferential trade arrangement encourage export platform FDI. The estimated coefficients of *POTENTIAL* and *PTA* are both positive and statistically significant. Thus, US multinational firms tend to locate export platform FDI in countries that have strong export market potential and in countries that are members of exclusive preferential trade agreements. Of the standard motivations for FDI, only host country market size as measured by *GDP* has an estimated coefficient that is statistically significant. The negative estimated coefficient on GDP is not surprising, given the strong relationship between local sales by foreign affiliates and host country market size identified previously in the literature.

To be confident in these results, we must address a potential cause for concern. Within the data, there are many missing or censored observations. This problem arises for two reasons. First, the construction of my dependent variable, as described in section 3, eliminates any observations for which either affiliate local sales or non-US bound affiliate exports are zero. Second, the BEA suppresses certain country-industry observations to avoid revealing confidential information about the activities of a particular multinational firm. A potential cause for concern, then, is that one or both of these factors may be introducing sample selection bias to my baseline estimation results.

Sample selection bias has long been a concern for labor economists; more recently, international trade economists have begun to address this problem[2]. The seminal approach to addressing sample selection bias is that of Heckman (1979). In Heckman's two-step approach, a probit selection equation is estimated in the first step. The results of

[2] See, for example, Helpman et al. (2004).

this estimation are used to compute the inverse Mill's ratio (IMR) for each observation, which is then included as an additional regressor in an OLS estimation in the second step. A valid test for sample selection bias is a test of the significance of the estimated coefficient of the IMR, where the null hypothesis is H_0: no sample selection bias (Wooldridge, 2002).

Since there are two distinct reasons for the missing observations in my data, they should be modeled separately. Thus, I model selection due to observations of zero affiliate sales and selection due to BEA data suppression for confidentiality in two separate first-stage probit equations and compute the IMRs from each. A valid test of sample selection bias in this case is a test of the joint significance of the estimated coefficients of the two IMRs.

The results of this procedure are reported in Table 1.4. The first column of Table 1.4 reports the estimation results from the probit selection equation for observations of zero affiliate sales. The second column reports the estimation results from the probit selection equation for BEA data suppression. The third column reports the second-step OLS estimation results, including the estimated coefficients and corresponding standard errors for the IMRs from the two first-step probit equations. For comparison, my baseline estimation results are reported in the fourth column. Under the null hypothesis of no sample selection bias, the estimated coefficients on the IMRs in the second-step regression should be jointly insignificant. I fail to reject the null hypothesis of no sample selection bias; the estimated coefficients of both IMRs are individually insignificant, and jointly insignificant ($F_{2,722} = 0.10$). These results indicate that my baseline estimation

results are robust to any sample selection bias potentially introduced by either the construction of my dependent variable or the BEA's data suppression.

Thus far, I have shown that export platform FDI is motivated by both a host country's export market potential and a host country's membership in exclusive preferential trade agreements. These results are robust to potential sample selection bias. One remaining question is whether these motivations for export platform FDI are significant motivations for FDI more generally, or whether these motivations are unique to export platform FDI. To investigate this question, I separately regressed 1) the natural log of total affiliate sales (TAS), 2) the natural log of non-US bound affiliate exports (AEX), and 3) the natural log of affiliate local sales (ALS) on the regresssors in my baseline specification described in section 3. The results from these regressions are reported in Table 1.5.

The first column of Table 1.5 reports the results from regressing the natural log of total affiliate sales on the regressors in my baseline specification. The fourth column of Table 1.5 reports my baseline estimation results for comparison. These results reinforce the point made by Hanson et al. (2001) that looking at total sales obscures important differences in the types of FDI in which multinational firms engage. Host country export market potential appears to weakly discourage total affiliate sales, although it strongly encourages export platform FDI.

The second and third columns of Table 1.5 report the results from regressing the natural log of affiliate exports and the natural log of affiliate local sales on the regressors in my baseline specification. As described in section 3, my dependent variable is constructed so that my baseline estimation results indicate which factors tend to motivate

non-US bound affiliate exports and affiliate local sales differently. The estimated coefficients from my baseline estimation results are simply the difference between the corresponding estimates in the second and third columns. These results help clarify what my baseline estimation results do and do not imply about the motivations for various types of FDI. For example, the fact that PCGDP is not significant in my baseline estimation does not mean that it doesn't motivate either affiliate exports or affiliate local sales, only that it doesn't motivate them in significantly different ways.

Looking at my two regressors of primary interest, *POTENTIAL* and *PTA*, two different stories emerge. In the case of *POTENTIAL*, the estimated coefficient from my baseline estimation results is highly significant because whereas export market potential encourages affiliate exports, it discourages local sales. In the case of *PTA*, the estimated coefficient from my baseline estimation results is highly significant because although preferential trade arrangement membership encourages both affiliate exports and affiliate local sales, it encourages the former nearly twice as strongly as it does the latter.

These results indicate that export market potential does seem to uniquely encourage export platform FDI, while preferential trade arrangement membership does not. Although export market potential strongly encourages affiliate exports, it appears to discourage both affiliate local sales and total affiliate sales. Thus, what previous researchers who have observed a positive statistical relationship between market potential and FDI have not explicitly identified is that the sole channel through which market potential encourages FDI is export platform FDI. Although host country membership in exclusive preferential trade agreements encourages affiliate exports significantly more

strongly than it encourages affiliate local sales, it does not uniquely encourage export platform FDI.

6. Conclusion

Export platform FDI is an increasingly prevalent form of FDI. Previous research has identified a standard set of country characteristics associated with FDI, but much of this research has aggregated all forms of FDI together, looking at data on total affiliate sales, regardless of the destination of those sales. In this chapter, I have rigorously investigated the motivations for export platform FDI as distinct from other forms of FDI. I proceeded by identifying two potential motivations for export platform FDI that are not part of the standard set of country characteristics thought to be associated with FDI that has been identified previously in the literature. These two potential motivations for export platform FDI are a host country's export market potential, as measured by a Harris-type measure of the host country's proximity to other large markets, and a host country's membership in an exclusive preferential trade agreement. My empirical analysis indicates that both of these motivations are highly significant and positively correlated with export platform activity. Furthermore, export market potential is uniquely associated with export platform FDI, whereas preferential trade agreement membership encourages all types of FDI (although export platform FDI more strongly than other forms). These results suggest that future empirical work on the motivations for FDI should not overlook the growing importance of export platform FDI by looking at aggregate FDI measures, such

as total affiliate sales, and should pay particular attention to the motivations for export platform FDI identified in this paper, especially export market potential.

TABLE 1.1

Exports of Majority-Owned Affiliates of US Multinational Firms to Countries Other than the US, 1999-2002

	1999		2000		2001		2002	
Industry	Value[1]	Share[2]	Value	Share	Value	Share	Value	Share
Mining	18,000	27.56%	22,041	23.85%	20,952	23.01%	25,095	26.65%
Utilities	106	0.32%	N/A	N/A	1,417	1.89%	1,381	3.40%
Manufacturing, Total	289,652	26.16%	332,805	28.32%	334,587	29.17%	348,331	28.82%
Food	17,209	20.27%	18,738	22.36%	19,996	23.68%	22,406	24.82%
Chemicals	55,967	29.52%	67,503	33.57%	67,376	32.89%	75,311	33.55%
Primary and fabricated metals	9,341	23.16%	9,372	23.82%	12,958	32.66%	13,609	33.97%
Machinery	17,116	27.53%	19,465	30.28%	19,586	32.39%	24,543	40.96%
Computers and electronic products	72,117	37.09%	91,259	40.68%	84,358	41.71%	75,142	36.32%
Electrical equipment	8,714	34.39%	9,982	35.30%	9,891	36.75%	8,831	33.91%
Transportation equipment	58,020	23.70%	60,935	23.94%	68,313	26.93%	73,893	27.16%
Wholesale trade	138,441	24.87%	157,383	23.82%	189,055	28.34%	194,265	30.01%
Information	8,052	11.40%	10,007	13.76%	11,003	14.30%	13,454	17.10%
Finance and insurance	23,440	15.49%	25,608	13.19%	40,982	21.15%	37,811	19.03%
Services	8,332	10.70%	9,478	11.77%	11,089	13.52%	10,405	13.12%
TOTAL, ALL INDUSTRIES	**493,067**	**22.22%**	**570,022**	**22.73%**	**625,762**	**24.79%**	**649,731**	**25.49%**

[1]exports of majority-owned affiliates of US multinational firms to countries other than the US in millions of US dollars

[2]exports of majority-owned affiliates of US multinational firms to countries other than the US as a percentage of total sales of majority-owned affiliates of US multinational firms

Data are from the US Department of Commerce Bureau of Economic Analysis: www.bea.gov

TABLE 1.2

Summary Statistics

Variable Abbreviation	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Dependent Variables					
EXLS	832	-1.490	1.898	-7.290	4.581
AEX	944	5.463	2.493	0.000	11.177
ALS	1718	5.859	2.313	0.000	11.066
TAS	2138	6.234	2.254	0.000	11.355
Explanatory Variables					
POTENTIAL	2640	1.985	0.663	0.880	3.485
PTA	2640	0.627	0.484	0.000	1.000
GDP	2640	5.510	1.380	1.334	8.670
PCGDP	2640	9.401	0.856	6.709	10.971
DISTANCE	2640	8.851	0.576	6.307	9.692
TARIFF	2616	8.565	5.872	0.000	33.000
TAX	1875	0.024	0.048	-0.375	1.000
LABOR	2135	34.457	22.388	1.379	170.000

TABLE 1.3

Baseline OLS Estimates

Dependent variable: EXLS

	Baseline OLS Estimates
POTENTIAL	0.8377 ***
	(0.1398)
PTA	0.5519 ***
	(0.1954)
GDP	-0.3571 ***
	(0.1067)
PCGDP	0.1131
	(0.3118)
DISTANCE	0.1539
	(0.1173)
TARIFF	-0.0510
	(0.0325)
TAX	-5.3211
	(5.1442)
LABOR	-0.0011
	(0.0069)
constant	-2.6966
	(3.8528)
Industry dummies	YES
Year dummies	YES
Observations	747
R-squared	0.5020

***, **, and * indicate 1, 5, and 10 percent significance, respectively

Standard errors are reported in parentheses below corresponding parameter estimates.

TABLE 1.4

Robustness to Sample Selection Bias

	Probit 1 Selection Estimates (zeroes)	Probit 2 Selection Estimates (BEA)	OLS Second-Step Regression Estimates	Baseline OLS Estimates
POTENTIAL	-0.1572 *	0.1463 ***	0.8857 ***	0.8377 ***
	(0.0830)	(0.0554)	(0.2860)	(0.1398)
PTA	0.2485 ***	-0.0010	0.5587 ***	0.5519 ***
	(0.0927)	(0.0670)	(0.1181)	(0.1954)
GDP	0.4345 ***	0.1769 ***	-0.2818	-0.3571 ***
	(0.0430)	(0.0272)	(0.3171)	(0.1067)
PCGDP	0.6549 ***	-0.2029 **	0.0765	0.1131
	(0.1041)	(0.0799)	(0.4294)	(0.3118)
DISTANCE	-0.0883	-0.1091 **	0.1169	0.1539
	(0.0908)	(0.0536)	(0.2079)	(0.1173)
TARIFF	0.0194 *	-0.0420 ***	-0.0643	-0.0510
	(0.0111)	(0.0086)	(0.0814)	(0.0325)
TAX	4.0252 ***	-1.0278	-5.5471	-5.3211
	(1.4125)	(1.1367)	(3.5660)	(5.1442)
LABOR	0.0111 ***	-0.0006	-0.0013	-0.0011
	(0.0030)	(0.0021)	(0.0040)	(0.0069)
constant	-7.7815 ***	1.8403 *	0.1826	-2.6966
	(1.3209)	(0.9540)	(0.5471)	(3.8528)
Inverse of Mill's Ratio from Probit 1 (zeroes)			0.6153	
			(3.2085)	
Inverse of Mill's Ratio from Probit 2 (BEA)			-3.0484	
			(2.5583)	
Industry dummies	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES
Total Observations	1717	1717	1717	
Censored Observations			970	
Uncensored Observations			747	747

***, **, and * indicate 1, 5, and 10 percent significance, respectively

Standard errors are reported in parentheses below corresponding parameter estimates.

TABLE 1.5

Total Sales, Affiliate Exports, and Affiliate Local Sales

	Dependent Variable			Baseline OLS Estimates
	TAS	***AEX***	***ALS***	
POTENTIAL	-0.2718 *	0.3952 *	-0.4425 ***	0.8377 ***
	(0.1503)	(0.2216)	(0.1421)	(0.1398)
PTA	0.7899 ***	1.2547 ***	0.7028 ***	0.5519 ***
	(0.1782)	(0.2788)	(0.1673)	(0.1954)
GDP	0.6324 ***	0.4417 ***	0.7988 ***	-0.3571 ***
	(0.0683)	(0.1254)	(0.0629)	(0.1067)
PCGDP	0.6124 ***	0.7614 *	0.6482 ***	0.1131
	(0.2287)	(0.4086)	(0.1905)	(0.3118)
DISTANCE	-0.5113 ***	-0.3418 *	-0.4957 ***	0.1539
	(0.1030)	(0.1765)	(0.0941)	(0.1173)
TARIFF	-0.0260	-0.0697	-0.0187	-0.0510
	(0.0266)	(0.0454)	(0.0213)	(0.0325)
TAX	-8.5334	-11.4559	-6.1348	-5.3211
	(5.5170)	(8.8835)	(5.0209)	(5.1442)
LABOR	0.0128 ***	0.0124	0.0135 ***	-0.0011
	(0.0034)	(0.0082)	(0.0033)	(0.0069)
constant	2.6411	-2.1358	0.5608	-2.6966
	(2.7331)	(5.0564)	(2.3780)	(3.8528)
Industry dummies	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES
Observations	747	747	747	747
R-squared	0.6673	0.5409	0.7381	0.5020

***, **, and * indicate 1, 5, and 10 percent significance, respectively

Standard errors are reported in parentheses below corresponding parameter estimates.

CHAPTER TWO: USING TRADE POLICY TO INFLUENCE FIRM LOCATION

1. Introduction

As multinational firms have emerged as the dominant players in the global economy, trade economists have tried to understand the causes and consequences of FDI. An important research agenda has been to identify country characteristics that influence a multinational firm's decision to serve a country via exports or FDI. Two important findings of this research are relevant to the current investigation. First, the "tariff-jumping" motive for FDI has been well-documented (Caves, 1982; Brander and Spencer 1987; Motta, 1992; Hwang and Mai, 2002). Put simply, the higher a country's tariffs on imports, the more likely a multinational firm will be to establish a foreign affiliate within that country, thereby "jumping" the high tariff barrier. Thus, high (low) tariffs will tend to encourage (discourage) FDI by multinational firms. Second, economic integration tends to encourage multinational firms headquartered outside a preferential trade agreement to establish a foreign affiliate inside the agreement to take advantage of lower internal barriers to trade (Motta and Norman, 1996; Neary, 2002; Ekholm et al., 2004). This is a logical extension of the tariff-jumping motive for FDI: If two countries form a free trade area, it is possible to bypass one country's high tariff barriers by establishing a foreign affiliate in the other country and exporting inside the free trade area. The important lesson from this research is that a country's trade policy and membership in preferential trade agreements influence multinational firms' decisions regarding the location of FDI.

As a rich tradition in public economics tells us, trade policy is not the only type of government policy that influences firms' location decisions. An extensive literature on tax competition for internationally mobile capital suggests that governments also use tax policy to influence the location of FDI. While such international tax competition is often wasteful, and results in inefficiently low tax rates (Wilson, 1999), Janeba (1998) shows that in the presence of imperfect competition, tax competition for internationally mobile firms can actually be welfare-improving.

Although many papers have explored the effects of either tariffs or taxes on the location of investment, very little research has investigated the effects of both tax and trade policy on firm location. Raff (2004) considers both tax and trade policy by examining how a high-cost country and a low-cost country will compete in taxes and tariffs to influence the location of FDI by a foreign monopolist, and how each country will adjust its policies in response to economic integration in the form of a free trade agreement (FTA). Raff makes several claims about how governments will respond to integration, and thus how integration will ultimately affect the firm's location choice. First, Raff claims that a FTA may cause "FDI creation," meaning that in the absence of a FTA, governments choose policies to encourage the firm to export rather than invest, but in the presence of a FTA, governments adjust their policies to induce the firm to establish a foreign affiliate in the low-cost country. Second, Raff claims that if, in the absence of a FTA, the firm invested in both countries, the FTA will cause "FDI consolidation," meaning that the firm will shut down its affiliate in the high-cost country and serve both countries from its affiliate in the low-cost country. Finally, Raff claims that a FTA cannot cause "FDI destruction," meaning that the firm operates at least one foreign affiliate in

the absence of a FTA, but in the presence of a FTA, the firm will serve both countries with exports.

Using Raff's basic model, this paper shows that the high-cost country has considerable power to influence a multinational firm's investment location decision using only trade policy, even when it cannot itself attract FDI. Specifically, the high-cost country may be able to prevent the firm from investing in the low-cost country even when the low-cost country wants to attract FDI. Furthermore, in contrast to Raff, this paper shows that a FTA may cause FDI destruction. In other words, the firm may choose to invest in the low-cost country in the absence of a FTA, but when the high-cost country and the low-cost country form a FTA, the high-cost country is able to use its trade policy to convince the firm to shut down its foreign affiliate in the low-cost country.

How can two papers using the same model generate different results? This paper considers a case of the model not considered by Raff. Whereas Raff assumes that the firm could profitably serve both countries with an affiliate in the high-cost country, this paper assumes that the firm could never profitably invest in the high-cost country. In other words, Raff assumes that the cost of production in the high-cost country is "not too much bigger" than the cost of production in the low-cost country, but this paper assumes that the cost of production in the high-cost country is "very high." As a result, the high-cost country will not be able to use its tax rate to influence the firm's location choice. However, since the government of the high-cost country cares whether or not the firm invests in the low-cost country, it will use its trade policy to influence the firm's location decision.

While the different results generated by this paper and Raff (2004) are primarily due to the different cases of the model being considered, the analysis in this paper sheds light on a mistake in Raff (2004). In the model, a FTA is unambiguously welfare-reducing for the high-cost country if it imports from the low-cost country, since a FTA eliminates the potential for positive tariff revenue. Raff (2004) mistakenly claims that a FTA between the two countries can create FDI that is welfare-improving for both countries[3]. The reason that FDI destruction occurs in the case considered in this paper is precisely because the high-cost country actively uses its trade policy to prevent the low-cost country from attracting FDI. Both because he mistakenly claims that FDI creation could be welfare-improving for the high-cost country in his model, and because he does not consider the specific case of the model analyzed in this paper, Raff (2004) mistakenly claims that a FTA cannot cause FDI destruction. This paper shows when and why FDI destruction may occur.

The rest of the paper is organized as follows. Section 2 provides the intuition for the results to be derived in the rest of the paper. Section 3 outlines the specifics of the theoretical model. Section 4 analyzes equilibria both without and with a FTA between H and L. Section 5 concludes.

2. The Intuition

In the model, a monopoly firm chooses how to supply two foreign countries. The firm may choose to export to one or both countries from its existing domestic production facility, or it may choose to establish a foreign affiliate (FDI) in one or both of the foreign

[3] FDI creation in Raff (2004) cannot be welfare-improving for the high-cost country (Cook 2006).

countries. If the firm chooses to establish a foreign affiliate, it must decide whether to use that affiliate for local sales in the host country only, or to also use the affiliate as an export platform for sales to the other foreign country.

The two foreign countries differ in the marginal cost of producing the monopoly firm's good, so we can refer to them as the high-cost country and the low-cost country. Both countries care about the firm's chosen supply strategy, and can use tax and/or trade policy to influence the firm's decision. If the firm chooses to supply a country with exports, that country's optimal tariff is positive, because of the firm's monopoly power (Vousden 1990). If the firm establishes a foreign affiliate in a country, that country wants to extract the maximum possible tax revenue from the foreign affiliate. For this reason, attracting a foreign affiliate that not only makes local sales in the host country market, but also exports to the other country (export platform FDI) may be particularly beneficial, since export platform FDI represents a much larger tax base than FDI for local sales only.

The cost difference between the two countries affects which policies are relevant for each country. It is assumed that the marginal cost of production in the high-cost country is sufficiently high that the high-cost country can never attract FDI. Thus, the high-cost country's tax policy is irrelevant, since it will never have a foreign affiliate to tax. Similarly, the low-cost country's tariff on imports from the high-cost country is irrelevant, since the firm will never produce in the high-cost country. This leaves the high-cost country with only trade policies: a tariff on imports from the firm's home country, and a tariff on imports from the low-cost country. The low-cost country can use both its tax and its tariff on imports from the firm's home country to influence the firm's decision.

The surprising result is that despite its own inability to attract the firm, the high-cost country, through its trade policy, can exert considerable influence on the firm's decision to establish FDI in the low-cost country. In particular, although the low-cost country always (weakly) prefers attracting export platform FDI to attracting FDI for local sales only, in the absence of a FTA between the high-cost country and the low-cost country, the low-cost country is only able to attract export platform FDI when the high-cost country prefers importing from the low-cost country to importing from the firm's home country. In a sense, the high-cost country is able to impose its preferences on the low-cost country in the absence of a FTA.

Perhaps even more surprising is the influence that the high-cost country has when the high-cost country and the low cost country form a FTA. Note that a FTA eliminates one of the high-cost country's two policy tools, since a FTA restricts the high-cost country's tariff on imports from the low-cost country to be zero. Left with only its tariff on imports from the firm's home country, the high-cost country can still prevent the firm from establishing export platform FDI in the low-cost country. In some cases, the high-cost country can lower its tariff on imports from the firm's home country enough to convince the firm to shut down an existing foreign affiliate in the low-cost country. To use Raff's term, a FTA can cause FDI destruction. The intuition for why this could happen is provided below.

The high-cost country's only decision is where it would prefer to import from. Assuming it is free to set whatever tariff it chooses on imports from either the firm's home country or the low-cost country, the high-cost country prefers to import from whichever location has the lower cost of production. If the cost of production in the low-

cost country is lower than the cost of production in the firm's home country, then the high-cost country prefers to import from the low-cost country. In the absence of a FTA, the firm may establish export platform FDI in the low-cost country, and if necessary, the high-cost country may be willing to lower its tariff on imports from the low-cost country in order to assist the low-cost country in attracting export platform FDI. However, a FTA between the low-cost country and the high-cost country eliminates tariff revenue for the high-cost country on imports from the low-cost country. If the low-cost country's cost of production advantage over the firm's home country is not sufficiently large to compensate for this loss of tariff revenue, then the high-cost country will attempt to lure the firm out of the low-cost country by lowering its tariff on imports from the firm's home country. If the high-cost country can convince the firm to source its exports to the high-cost country from the firm's home country rather than from the low-cost country, then the low-cost country will no longer be able to attract export platform FDI, and the FTA will cause FDI destruction.

3. The Model

A monopoly producer of good X operates a plant in country F. Consumers of good X reside in two foreign countries, H and L. Demand for X in country $i \in \{H, L\}$, x_i, is given by:

$$x_i = 1 - p_i \tag{1}$$

where p_i is the price the monopoly firm charges in country i.

The firm must choose the profit maximizing supply mode for serving consumers in H and L. One option is to export to both H and L from the established plant in F, where the constant marginal cost of production is $f < 1$. However, the firm may also choose to establish a foreign affiliate in either H or L or both, and pay a fixed (but not sunk) cost of G per foreign affiliate. If the firm invests abroad, the constant marginal costs of production in H and L are h and l, respectively, with $l < h < 1$. In other words, H is the "high-cost" foreign location, and L is the "low-cost" foreign location.

The firm has six potential supply strategies:

1) Export to both H and L from F.

2) Export to H, and establish a foreign affiliate for local sales in L.

3) Export to L, and establish a foreign affiliate for local sales in H.

4) Establish a foreign affiliate in L for both local sales in L and export sales to H.

5) Establish a foreign affiliate in H for both local sales in H and export sales to L.

6) Establish a foreign affiliate in both L and H, using each for local sales only.

The governments of H and L are not indifferent about the firm's decision, and have policy tools at their disposal to influence the firm's supply strategy. Specifically, H and L each have three policy instruments:

1) a tariff rate on imports from F, r_{iF} $\quad i \in \{H, L\}$

2) a tariff rate on imports from the other country, r_{ij} $\quad i, j \in \{H, L\}, i \neq j$

3) a tax rate on profits from firm sales originating in i, t_i $\quad i \in \{H, L\}$

The governments of H and L choose available policy tools noncooperatively to maximize their respective social welfare functions, which consist of consumer surplus and tax or tariff revenue.

The central question of this chapter, then, is how the governments of H and L will use their available policy tools to influence the firm's supply strategy. Furthermore, how will these decisions change in the presence of a free trade agreement (FTA) between H and L? Note that a FTA between H and L restricts each government's available policy tools. In particular, a FTA restricts $r_{HL} = r_{LH} = 0$.

The timing of the interactions between H, L, and the firm can be summarized as follows:

Stage 1: H and L choose available policy instruments noncooperatively.

Stage 2: The firm observes the policies of H and L and chooses its supply strategy.

Stage 3: The firm chooses p_H and p_L to maximize profits, given its supply strategy.

The (subgame perfect) equilibria of the model, both with and without a FTA between H and L, can be solved for using backward induction.

We begin by looking at Stage 3, in which the firm chooses its profit maximizing prices, taking as given the values of the taxes and tariffs chosen by H and L, and its own chosen supply strategy.

For illustration, consider that the firm's chosen supply strategy is 4), in which the firm establishes a foreign affiliate in L to serve customers in both L and H (export platform FDI). The firm solves the following profit maximization problem:

$$\max_{p_H, p_L} (1 - t_L)[(p_L - l)(1 - p_L) + (p_H - l - r_{HL})(1 - p_H) - G] \qquad (2)$$

The first two terms inside the square brackets represent the firm's pre-tax profits from serving consumers in L with locally-produced X (gross of the fixed cost of establishing a foreign affiliate in L). The second two terms inside the square brackets represent the firm's pre-tax profits from serving consumers in H with exports from L, facing H's tariff rate against imports from L, r_{HL}. The final term inside the brackets is the fixed cost of

establishing a foreign affiliate in L. Because all of these sales originate in L, all of the profits (net of the fixed cost of establishing a foreign affiliate) are subject to L's profit tax rate, t_L.

The profit maximizing prices are $p_L = (1 + l)/2$ and $p_H = (1 + l + r_{HL})/2$. The corresponding quantities are $x_L = (1 - l)/2$ and $x_H = (1 - l - r_{HL})/2$. This generates an after-tax profit for the firm of

$$(1 - t_L)\left[\frac{(1-l)^2}{4} + \frac{(1-l-r_{HL})^2}{4} - G\right] \tag{3}$$

Given these prices, the social welfare in L is

$$\frac{(1-l)^2}{8} + t_L\left[\frac{(1-l)^2}{4} + \frac{(1-l-r_{HL})^2}{4} - G\right] \tag{4}$$

The first term in (4) is the consumer surplus from consuming locally-produced X. The second term in (4) is L's tax revenue. The social welfare in H is

$$\frac{(1-l-r_{HL})^2}{8} + r_{HL}\frac{(1-l-r_{HL})}{2} \tag{5}$$

The first term in (5) is the consumer surplus from consuming X imported from L. The second term in (5) is H's tariff revenue.

H and L will choose their available policy instruments to maximize social welfare. Note that (4) is strictly increasing in t_L, so assuming that L wants to attract FDI, it will want to set t_L as high as possible as long as the firm will still invest. The same is not true of (5). Assuming that H's choice of r_{HL} will not affect the firm's supply strategy, H faces the following maximization problem:

$$\max_{r_{HL}} \frac{(1-l-r_{HL})^2}{8} + r_{HL}\frac{(1-l-r_{HL})}{2} \tag{6}$$

H's "optimal tariff" on imports from L is thus $r_{HL}^* = (1 - l)/3$. Given this tariff rate, H's social welfare from importing from L is $(1 - l)^2/6$, and the firm's pre-tax profit from exporting from L to F (gross of the fixed cost of investing in L) is $(1 - l)^2/9$.

To this point, the model is very similar to the model in Raff (2004). The major difference between the present model and Raff's model is a different assumption about the cost parameters in the model. So far, the model assumes that $l < h < 1$. However, Raff further assumes that the cost of production in H (h) is "not too much bigger" than the cost of production in L (l)[4]. In contrast, this paper makes the following assumption:

Assumption 1: $G > \left(\frac{(1-h)^2}{2}\right)$

Assumption 1 does not restrict the difference between h and l, but does imply that h is large. In particular, h is large enough that under no circumstances will the firm choose to invest in H. This assumption has important consequences for the model.

First, it restricts the number of reasonable supply strategies for the firm from six to three. In particular, since the firm will never choose to invest in H, the firm's remaining reasonable supply strategies are to export to both H and L from F, to export from F to H and establish a foreign affiliate in L for local sales in L only, or to establish a foreign affiliate in L for both local sales in L and export sales to H.

Second, it restricts the relevant policy tools for both H and L. In particular, since H will never attract FDI, t_H is irrelevant. By the same token, since H will never attract FDI, L will never import from H, and thus r_{LH} is irrelevant. This leaves each country with

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[4] Using the notation in this paper, Raff (2004) assumes $G < \frac{5(1-h)^2 - (1-l)^2}{8}$. For both this inequality and *Assumption 1* to be satisfied requires $l > h$. Thus, this paper considers a case not considered in Raff (2004).

two relevant policy tools in the absence of a FTA. L is left with a tariff rate against imports from F, r_{LF}, and a tax rate on profits generated from sales originating in L, t_L. It is significant to note that H is left with only trade policy tools: a tariff rate on imports from F, r_{HF}, and a tariff rate on imports from L, r_{HL}. Thus, even though H cannot itself attract FDI, H cares from which country it imports, and may be able to use its trade policy tools to influence the firm's decision. Note also that if H and L form a FTA, L does not lose any policy tools (since it never imports from H anyway), but H loses one of its two policy tools, since a FTA restricts $r_{HL} = 0$. The implications of this will be explored in greater detail below. The following section derives the equilibrium policies of H and L and the equilibrium supply strategy of the firm, both without and with a FTA between H and L.

4. Equilibria

As explained in Section 2, an important consideration is the relationship between l and f. For illustration, we will consider the case in which $l < f$[5]. This means that the low-cost country has a cost of production advantage over the firm's home country. Further, we will assume:

Assumption 2: $\left(\frac{(1-f)^2}{6}\right) \geq \left(\frac{(1-l)^2}{8}\right)$

[5] Results for the case in which $l > f$ are qualitatively similar to the results derived from the case considered here. The central difference is that in the absence of a FTA between H and L when $l > f$, L will not attract export platform FDI. If L attracts FDI, it is for local sales only. A FTA may still cause FDI destruction in this case, and for the same reasons: H lowers its tariff rate against imports from F to prevent the firm from locating FDI in L.

Assumption 2 implies that although the low-cost country has a cost of production advantage over the firm's home country, this cost of production advantage is small[6]. *Assumption 2* has two important interpretations. From H's perspective, *Assumption 2* means that despite L's cost of production advantage over F, H prefers to import from F and levy its optimal tariff than to import from L tariff-free. From L's perspective, *Assumption 2* means that the consumer surplus that consumers in L enjoy from consuming locally-produced X is smaller than the social welfare in L from importing X from F and levying L's optimal tariff. This means that for L to prefer attracting FDI to importing from F, L must be able to collect some positive amount of tax revenue.

Equilibria without a FTA between H and L

First, consider equilibria in the absence of a FTA between H and L. Since $l < f$, there is an *ex ante* cost advantage to the firm from locating production in L. However, depending on both the exogenous fixed cost of establishing a foreign affiliate in L (G) and the endogenous policy choices of H and L, the firm may choose to locate production in F, despite the higher marginal cost of production. If the firm locates production in L, it has a second decision about whether to export to H from F or from L.

H has two available trade policies to influence the firm's location decision: r_{HL} and r_{HF}. If the firm chooses to establish export platform FDI in L and export from L to H, H's social welfare will be maximized by $r_{HL}^* = (1 - l)/3$. Similarly, if the firm chooses to

[6] Even if *Assumption 2* is violated and L has a large cost of production advantage, a FTA may cause FDI destruction. If *Assumption 2* is violated, then in the absence of a FTA H prefers to subsidize imports from L rather than import from F. If a FTA between H and L prevents H from subsidizing imports from L, a FTA may cause FDI destruction.

locate production in F and export from F to H, H's social welfare will be maximized by $r_{HF}^* = (1 - f)/3$.Since we are looking at the case in which $l < f$, H prefers importing from L at r_{HL}^* and earning a social welfare of $(1 - l)^2/6$, to importing from F at r_{HF}^* and earning a social welfare of $(1 - f)^2/6$. In fact, because of L's cost of production advantage, H would prefer importing from L and levying $r_{HL} < r_{HL}^*$ to importing from F and levying r_{HF}^*. L will prefer to import from L as long as:

$$\left(\frac{(1-l-r_{HL})^2}{8}\right) + r_{HL}\left(\frac{(1-l-r_{HL})}{2}\right) \geq \left(\frac{(1-f)^2}{6}\right) \qquad (7)$$

The left-hand side of (7) is L's social welfare from importing from L and levying r_{HL}. The right-hand side of (7) is L's social welfare from importing from F and levying r_{HF}^*. By *Assumption 2*, (7) is violated for $r_{HL} = 0$, but since $l < f$, (7) is satisfied for $r_{HL} = r_{HL}^*$. Define $\tilde{r}_{HL} \in [0, r_{HL}^*]$ as the value of r_{HL} that satisfies (7) with equality. $\tilde{r}_{HL}$ is the smallest value of r_{HL} that H would be willing to set to encourage the firm to establish export platform FDI in L. Note that the left-hand side of (7) is strictly increasing in r_{HL} in $(\tilde{r}_{HL}, r_{HL}^*)$, meaning that although L still prefers importing from L and levying $r_{HL} \in (\tilde{r}_{HL}, r_{HL}^*)$ to importing from F and levying $r_{HF} = r_{HF}^*$, L's social welfare from importing from L increases the higher tariff rate it sets against imports from L (up to r_{HL}^*). H's social welfare from importing from L and from F, as well as $\tilde{r}_{HL}$, r_{HF}^*, and r_{HL}^*, are illustrated graphically in Figure 2.1.

Since H prefers importing from L to importing from F as long as (7) is satisfied, and since (7) can be satisfied for for $r_{HL} \in (\tilde{r}_{HL}, r_{HL}^*)$, H can raise its tariff rate against imports from F to a level that would eliminate any profits for the firm from exporting from F to H, $r_{HF} = 1 - f$. This is effectively a "stick-and-carrot" strategy; because L

prefers importing from L to importing from F, it can raise its tariff rate against imports from F (the stick) to discourage the firm from locating production in F, and if necessary, L may lower its tariff rate against imports from L as low as $\tilde{r}_{HL}$ (the carrot) to encourage the firm to export to H from L.

Thus, if the firm locates production in L, it will use that investment as an export platform for H, since H can employ the stick-and-carrot strategy described above to induce the firm to export to H from L rather than from F. The firm's decision then, is between establishing export platform FDI in L and exporting to both H and L from F. For the firm to prefer establishing export platform FDI in L requires:

$$(1 - t_L)\left(\frac{(1-l)^2}{4} + \frac{(1-l-r_{HL})^2}{4} - G\right) \geq \frac{(1-l-r_{LF})^2}{4} \qquad (8)$$

The left-hand side of (8) is the firm's after-tax profits from establishing export platform FDI in L, where exports from L to H would face a tariff of r_{HL}. The right-hand side of (8) is the firm's profit from exporting to both H and L from F, where exports to H would face $r_{HF} = 1 - f$, and exports to L would face r_{LF}. Whether or not (8) is satisfied depends on both the exogenous fixed cost of investment (G) and L's endogenously chosen policies (t_L and r_{LF}). In particular, note that if L prefers to attract export platform FDI, then like H, L can discourage imports from F by setting $r_{LF} = 1 - f$, and (8) will be satisfied with equality for $t_L = 1$. On the other hand, if L prefers to import from F, it can set $t_L = 1$ and $r_{LF} < 1 - f$ and (8) will be violated. In neither case does H's choice of r_{HL} matter for the firm's decision (although it does influence L's preference).

If L imports from F, L's social welfare is maximized by levying $r_{LF}^* = (1-f)/3$. L's social welfare from attracting export platform FDI is complicated, because it depends not only on the tax rate chosen by L, t_L, but also on the exogenous fixed cost of investment, G, and on the tariff rate levied by H against imports from L, r_{HL}. For L to prefer attracting export platform FDI to importing from F requires:

$$\frac{(1-l)^2}{8} + t_L\left(\frac{(1-l)^2}{4} + \frac{(1-l-r_{HL})^2}{4} - G\right) \geq \frac{(1-f)^2}{6} \tag{9}$$

The left-hand side of (9) is L's social welfare from attracting export platform FDI, where exports from L to H face a tariff of r_{HL}. The right-hand side of (9) is L's social welfare from importing from F and levying r_{LF}^*. Define $\hat{r}_{HL}$ as the value of r_{HL} that satisfies (9) with equality for $t_L = 1$. From (7), the smallest value of r_{HL} that H would be willing to set to encourage the firm to invest in L is $\tilde{r}_{HL}$. Thus, the largest value of G for which (9) could be satisfied is

$$\underline{G}(\tilde{r}_{HL}) = \left(\frac{3(1-l)^2}{8} + \frac{(1-l-\tilde{r}_{HL})^2}{4} - \frac{(1-f)^2}{6}\right) \tag{10}$$

If $G > \underline{G}(\tilde{r}_{HL})$, then $\hat{r}_{HL} < \tilde{r}_{HL}$ and H will not be willing to set r_{HL} low enough for L to prefer attracting export platform FDI to importing from F. If L prefers importing from F to attracting export platform FDI, it will set $t_L = 1$ and $r_{LF} = r_{LF}^*$ and the firm will choose to locate production in F, since (8) will be violated. If $G \leq \underline{G}(\tilde{r}_{HL})$, H will set $r_{HL} = \hat{r}_{HL}$ and (9) will be satisfied with equality, so L will set $t_L = 1$ and $r_{LF} = 1 - f$ and the firm will locate export platform FDI in L. If $G \leq \underline{G}(r_{HL}^*)$ where

$$\underline{G}(r_{HL}^*) = \left(\frac{35(1-l)^2}{72} - \frac{(1-f)^2}{6}\right) \tag{11}$$

then H will set $r_{HL} = r_{HL}^*$ and (9) will not be binding, so L will strictly prefer to attract export platform FDI.

Proposition 1. In the absence of a FTA between H and L:

(a) if $G \leq \underline{G}(r_{HL}^*)$, H will set ($r_{HF} = 1 - f$, $r_{HL} = r_{HL}^*$), L will set ($r_{LF} = 1 - f$, $t_L = 1$), and the firm will establish export platform FDI in L in equilibrium.

(b) if $G \in (\underline{G}(r_{HL}^*), \underline{G}(\tilde{r}_{HL})]$, H will set ($r_{HF} = 1 - f$, $r_{HL} = \hat{r}_{HL}$), L will set ($r_{LF} = 1 - f$, $t_L = 1$), and the firm will establish export platform FDI in L in equilibrium.

(c) if $G > \underline{G}(\tilde{r}_{HL})$, H will set ($r_{HF} = r_{HF}^*$, $r_{HL} = \tilde{r}_{HL}$), L will set ($r_{LF} = r_{LF}^*$, $t_L = 1$), and the firm will export to both H and L from F.

Equilibria with a FTA between H and L

Now consider equilibria in the presence of a FTA between H and L. A FTA restricts $r_{HL} = 0$. Given *Assumption 2*, H prefers importing from F and levying r_{HF}^* to importing from L tariff-free. Even though H's social welfare from importing from F is maximized by r_{HF}^*, H may be willing to set $r_{HF} < r_{HF}^*$ to encourage the firm to export from F to H rather than from L to H. For H to prefer importing from F and setting r_{HF} to importing tariff-free from L requires

$$\left(\frac{(1-f-r_{HF})^2}{8}\right) + r_{HF}\left(\frac{(1-f-r_{HF})}{2}\right) \geq \left(\frac{(1-l)^2}{8}\right) \qquad (12)$$

The left-hand side of (12) is H's social welfare from importing from F and setting r_{HF}. The right-hand side of (12) is H's social welfare from importing tariff-free from L. Since

$l < f$, (12) will be violated for $r_{HF} = 0$, but by *Assumption 2*, (12) will be satisfied for r_{HF}*. Define $\tilde{r}_{HF} \in [0, r_{HF}^*]$ as the value of r_{HF} that satisfies (12) with equality. Thus, $\tilde{r}_{HF}$ is the smallest value of r_{HF} that H would be willing to set to prevent the firm from investing in L. A graphical illustration of $\tilde{r}_{HF}$ is provided in Figure 2.2.

Engaging in export platform FDI in L is much more attractive to the firm in the presence of a FTA than in the absence of a FTA. Since $r_{HL} = 0$, the firm's pre-tax profits from export platform FDI in L are larger than they would be in the absence of a FTA between H and L (when H would set $r_{HL} > 0$).

Since any profit that the firm generates in L is L's tax base, L will also be more willing to attract FDI in the presence of a FTA than in the absence of a FTA. For L to prefer attracting export platform FDI to importing from F requires

$$\left(\frac{(1-l)^2}{8}\right) + t_L\left(\frac{(1-l)^2}{4} + \frac{(1-l)^2}{4} - G\right) \geq \left(\frac{(1-f)^2}{6}\right) \tag{13}$$

The first term on the left-hand side of (13) is L's consumer surplus from consuming locally-produced X. The second term on the left-hand side of (13) is L's tax revenue from the firm's profits from local sales in L and tariff-free exports from L to H, net of the fixed cost of establishing the affiliate in L. The right-hand side of (13) is L's social welfare from importing from F and levying r_{LF}*.

Whether or not (13) is satisfied depends not only on the parameters l, f and G, but also on L's endogenously chosen tax rate, t_L. Assuming for a moment that L could impose its maximal tax rate, $t_L = 1$, the largest value of G for which (13) could be satisfied is

$$\overline{\overline{G}} = \left(\frac{15(1-l)^2 - 4(1-f)^2}{24} \right) \tag{14}$$

That is, $\overline{\overline{G}}$ is the largest possible fixed cost for which L would be willing to attract export platform FDI. If $G < \overline{\overline{G}}$, there are values of t_L for which (13) could be satisfied. If $G > \overline{\overline{G}}$, L will prefer importing from F to attracting export platform FDI. Note that $\overline{\overline{G}} > \underline{G}(\tilde{r}_{HL})$, confirming that L is more willing to attract FDI in the presence of a FTA than in the absence of a FTA.

In what follows, assume that $G < \overline{\overline{G}}$. Define $\underline{t_L}(G)$ as the tax rate that satisfies (13) with equality for a given value of G. For any $t_L < \underline{t_L}(G)$, (13) will be violated, and L will prefer importing from F and levying r_{LF}^* to attracting export platform FDI. For any $t_L > \underline{t_L}(G)$, (13) will be satisfied, and L will prefer attracting export platform FDI to importing from F. Thus, $\underline{t_L}(G)$ is the lowest possible tax rate that L would be willing to set to attract export platform FDI, given the fixed cost of investment faced by the firm. Note that $\frac{\partial \underline{t_L}(G)}{\partial G} > 0$. In other words, the larger the fixed cost of investment, the smaller the firm's (pre-tax) profit from export platform FDI in L, and thus the larger that tax rate that will be necessary for L to be willing to attract export platform FDI.

The preceding analysis identifies when L is willing to attract export platform FDI, but for L to be able to attract export platform FDI, the firm must prefer establishing export platform FDI in L to exporting to H and L from F[7]. Note that the firm's decision to locate export platform FDI in L is not only a decision about how to serve L, but also a

[7] Because of the economies of scale generated by the fixed cost of investment, it will not be profit maximizing for the firm to invest in L for local sales only, and export to H from F.

decision about how to serve H. For the firm to prefer establishing export platform FDI in L to exporting to both H and L from F requires:

$$(1-t_L)\left(\frac{(1-l)^2}{4}+\frac{(1-l)^2}{4}-G\right)\geq\left(\frac{(1-f-r_{HF})^2}{4}\right)+\left(\frac{(1-f-r_{LF})^2}{4}\right) \qquad (15)$$

The left-hand side of (15) is the firm's after-tax profit from export platform FDI in L. The right-hand side of (15) is the firm's profit from exporting from F to H and facing a tariff of r_{HF} and exporting from F to L and facing a tariff of r_{LF}.

Inequality (15) illustrates one of the interesting features of the model. Whereas the preferences of H and L regarding the firm's location decision are aligned in the absence of a FTA (both H and L prefer for the firm to locate in L, provided the fixed cost of investment is not to large), H and L have opposing preferences about the firm's location decision in the presence of a FTA (L prefers to attract export platform FDI, but H prefers for the firm not to locate in L). Not only do H and L have opposing preferences about the firm's location decision, but both H and L have policy instruments available to influence the firm's decision. Assuming $G<\overline{\overline{G}}$, L wants to attract export platform FDI, so it will set $r_{LF}=1-f$ to discourage the firm from exporting to L from F and set t_L as high as possible while still satisfying (15) to extract the maximum possible tax revenue from the firm's investment. H, on the other hand, strictly prefers importing from F and levying $r_{HF}\in(\tilde{r}_{HF}, r_{HF}^*)$ to importing tariff-free from L, and thus wants to set r_{HF} as low as possible to violate (15) and encourage the firm to export to H from F. L will be willing to lower t_L as low as $\underline{t_L}$ (G) to encourage the firm to locate export platform FDI in L. H will be willing to lower r_{HF} as low as $\tilde{r}_{HF}$ to encourage the firm to locate production in F and export to H. Thus, in the presence of a FTA between H and L, when $G<\overline{\overline{G}}$,

there exists a "Bertrand-type" competition between L's profit tax rate, t_L, and H's tariff rate on imports from F, r_{HF}. Given this competition between H and L, (15) reduces to

$$(1 - t_L)\left(\frac{(1-l)^2}{4} + \frac{(1-l)^2}{4} - G\right) \geq \left(\frac{(1-f-\tilde{r}_{HF})^2}{4}\right) \tag{16}$$

The left-hand side of (16) is identical to the left-hand side of (15), but the right-hand side of (16) is equal to the right-hand side of (15) for $r_{HF} = \tilde{r}_{HF}$ and $r_{LF} = 1 - f$.

Define $\overline{t_L}(G)$ as the value of t_L that satisfies (16) with equality for a given G. If $t_L \leq \overline{t_L}(G)$, the firm will establish export platform FDI in L. If $t_L > \overline{t_L}(G)$, the firm will export to both H and L from F. Thus, $\overline{t_L}(G)$ is the maximum tax rate for which the firm will establish export platform FDI in L. Note that $\frac{\partial \overline{t_L}(G)}{\partial G} < 0$. In other words, the larger the fixed cost of investment, the smaller the firm's pre-tax profit from export platform FDI in L, and thus the smaller the tax rate necessary for the firm to be willing to establish export platform FDI in L.

Given the competition between H and L to influence the firm's location choice, for L to prefer to attract export platform FDI requires the tax rate to be "big enough" for a given G, as defined by $\underline{t_L}(G)$. For the firm to be willing to establish export platform FDI in L requires L's tax rate not to be "too big" for a given G, as defined by $\overline{t_L}(G)$.

Define $\underline{\underline{G}}$ such that:

$$\underline{t_L}(\underline{\underline{G}}) = \overline{t_L}(\underline{\underline{G}}) \tag{17}$$

$\underline{\underline{G}}$ is the largest value of G for which L will be willing and able to attract export platform FDI. The relationship between $\underline{t_L}(G)$, $\overline{t_L}(G)$, and $\underline{\underline{G}}$ is shown graphically in Figure 2.3.

If $G < \underline{\underline{G}}$, L will set $t_L = \overline{t_L}(G)$ and $r_{LF} = 1 - f$, and (15) will be satisfied for any $r_{HF} \in (0, 1 - f)$, so the firm will establish export platform FDI in L. If, on the other hand, $G > \underline{\underline{G}}$, H will set $r_{HF} = \hat{r}_{HF} \in (\tilde{r}_{HF}, r_{HF}^*)$, where

$$(1 - \underline{t_L}(G)) \left(\frac{(1-l)^2}{4} + \frac{(1-l)^2}{4} - G \right) = \left(\frac{(1-f-\hat{r}_{HF})^2}{4} \right) \tag{18}$$

The left-hand side of (18) is the firm's after-tax profit from export platform FDI in L, facing a tax rate of $\underline{t_L}(G)$. The right-hand side of (18) is the firm's profit from exports from F to H facing $r_{HF} = \hat{r}_{HF}$ and exports from F to L facing $r_{LF} = 1 - f$. In other words, H will set its tariff rate on imports to make the firm just indifferent between export platform FDI in L and exports to both H and L from F. Thus, if $G > \underline{\underline{G}}$, the firm will export to both H and L from F.

Finally, define $\overline{G}$ such that:

$$(1 - \underline{t_L}(G)) \left(\frac{(1-l)^2}{4} + \frac{(1-l)^2}{4} - G \right) = \left(\frac{(1-f)^2}{9} \right) \tag{19}$$

The left-hand side of (19) is the firm's after-tax profits from export platform FDI in L, facing a tax rate of $\underline{t_L}(G)$. The right-hand side of (19) is the firm's profits from exports from F to H facing $r_{HF} = r_{HF}^*$ and exports from F to L facing $r_{LF} = 1 - f$. If $G \geq \overline{G}$, H will be able to set r_{HF}^* and the firm will still choose to export from F to H. If $G < \overline{G}$, H will have to set $\hat{r}_{HF} < r_{HF}^*$ to entice the firm to export from F to H rather than from L to H.

Proposition 2. In the presence of a FTA between H and L:

(a) if $G \leq \underline{\underline{G}}$, H will set ($r_{HF} = \tilde{r}_{HF}$), L will set ($r_{LF} = 1 - f$, $t_L = \overline{t}_L(G)$), and the firm will establish export platform FDI in L in equilibrium.

(b) if $G \in (\underline{\underline{G}}, \overline{G})$, H will set ($r_{HF} = \hat{r}_{HF}$), L will set ($r_{LF} = r_{LF}^*$, $t_L = \underline{t}_L(G)$), and the firm will export from F to both H and L in equilibrium.

(c) if $G \in [\overline{G}, \overline{\overline{G}})$, H will set ($r_{HF} = r_{HF}^*$), L will set ($r_{LF} = r_{LF}^*$, $t_L = \underline{t}_L(G)$), and the firm will export from F to both H and L in equilibrium.

(d) if $G \geq \overline{\overline{G}}$, H will set ($r_{HF} = r_{HF}^*$), L will set ($r_{LF} = r_{LF}^*$, $t_L = 1$), and the firm will export from F to both H and L in equilibrium.

The firm's equilibrium location decisions, both in the absence of a FTA between H and L and in the presence of a FTA between H and L, are illustrated in Figure 2.4.

A surprising result, given Raff's claim that a FTA cannot cause FDI destruction, is that $\underline{\underline{G}} \leq \underline{G}(\tilde{r}_{HL})$, which means that if $G \in (\underline{\underline{G}}, \underline{G}(\tilde{r}_{HL}))$, the firm will establish export platform FDI in L in the absence of a FTA between H and L (since $G < \underline{G}(\tilde{r}_{HL})$), but will export to both H and L from F in the presence of a FTA (since $G > \underline{\underline{G}}$). Thus, a FTA may cause FDI destruction.

Proposition 3. If $G \in (\underline{\underline{G}}, \underline{G}(\tilde{r}_{HL}))$, a FTA between H and L will cause FDI destruction.

How does eliminating the tariff barrier between H and L make locating production in L *less* attractive to the firm? It doesn't; *ceteris paribus*, it makes locating production in L *more* attractive to the firm. It also increases L's willingness to attract

export platform FDI. So why, if a FTA makes locating production in L more attractive than in the absence of a FTA, doesn't a FTA cause FDI creation as in Raff (2004), instead of FDI destruction? FDI destruction occurs because in response to economic integration with L, H lowers its external tariff against imports from F, making locating production in F instead of L *more* attractive to the firm than in the absence of a FTA. In other words, H uses its trade policy to influence the firm's location decision.

5. Conclusion

This chapter has shown that even if a country cannot itself attract FDI, it has considerable power, through its trade policies, to influence a multinational firm's location decisions. Because a country's optimal tariffs are positive in this model, economic integration in the form of a FTA may generate competition between the low-cost country's tax rate and the high-cost country's external tariff rate to influence the firm's location decision. In some cases, the high-cost country may be able to "win" this competition, in the sense that it is able to set its external tariff rate low enough to prevent the firm from investing in the low-cost country. Because of this competition, a FTA may cause FDI destruction, meaning that the monopolist operated a foreign affiliate in the low-cost country in the absence of a FTA, but the competition between the integrating countries in the presence of a FTA induces the firm to serve the FTA with exports.

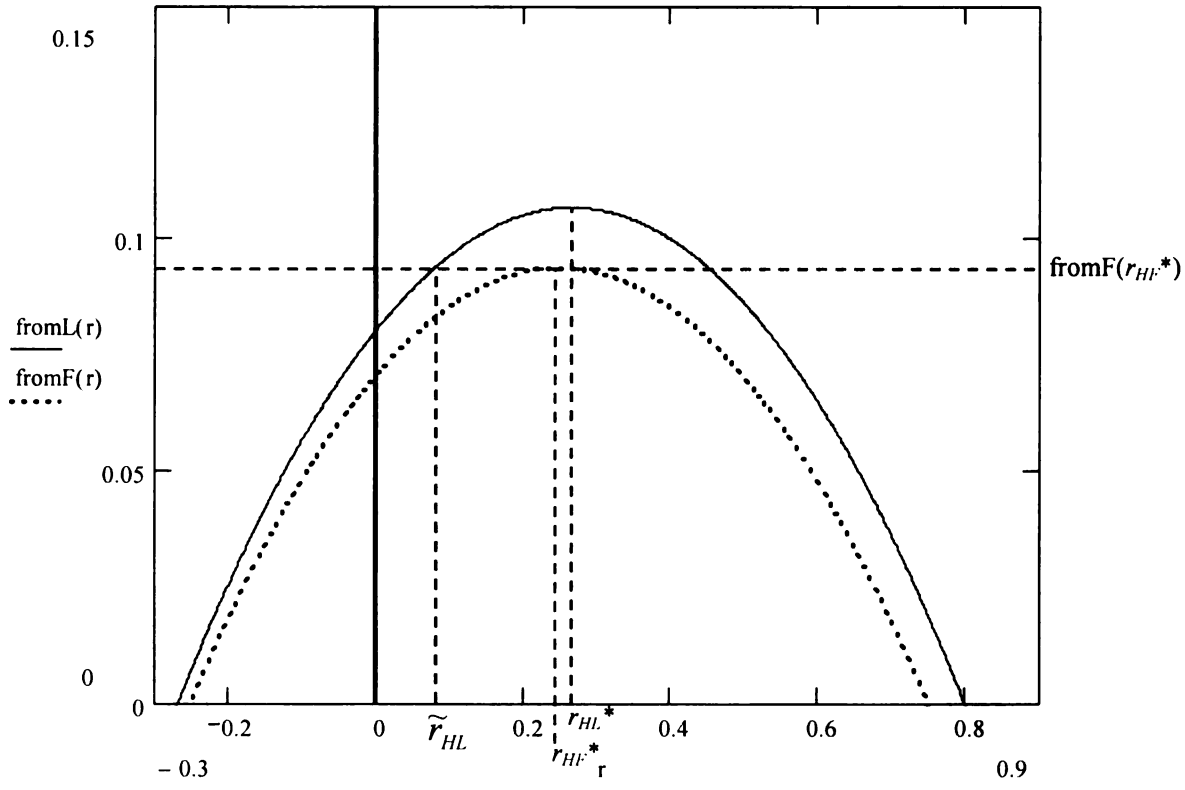
This chapter leaves several interesting questions for future investigation. For example, what are the welfare effects of economic integration in the form of a FTA for the integrating countries? Does this model provide new insights into the trade creation

and trade diversion effects of economic integration? What about the relationship between bilateral trade liberalization and multilateral trade liberalization? between trade liberalization and investment liberalization? These are all potential areas for future research using this relatively simple model.

Figure 2.1

A Graphical Illustration of $\tilde{r}_{HL}$

$l = 0.2$ $f = 0.25$



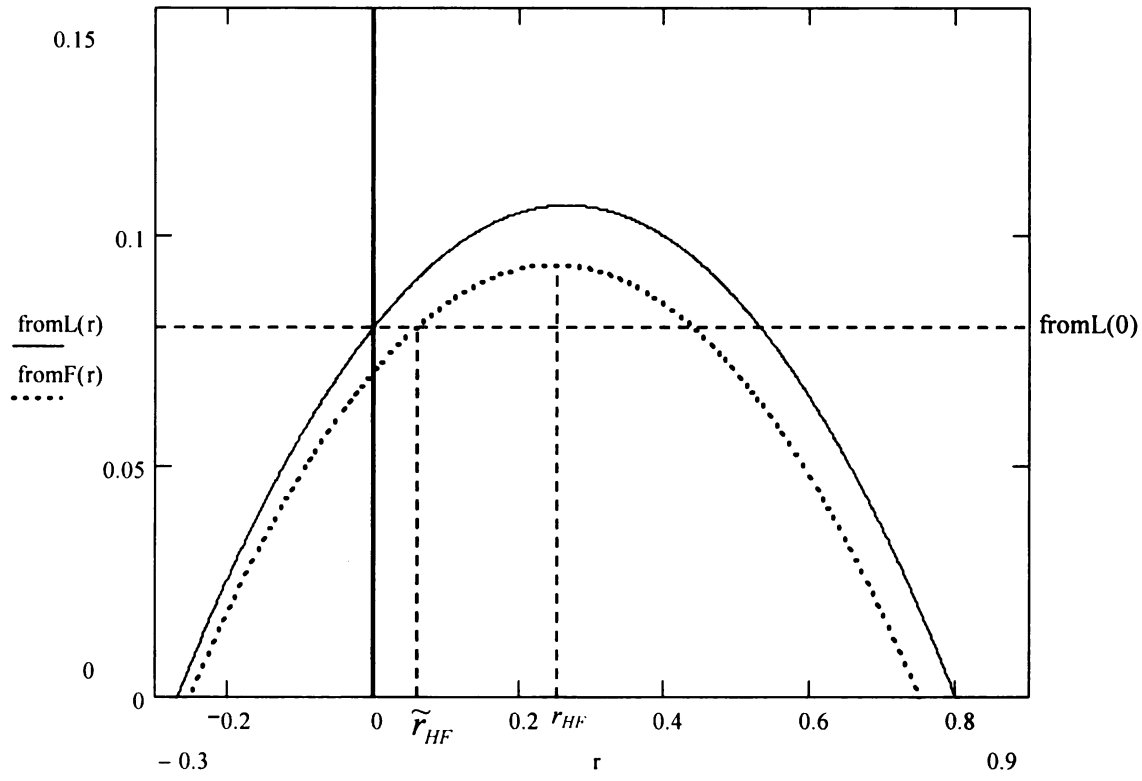
fromL(r) is H's social welfare from importing from L and levying r_{HL}

fromF(r) is H's social welfare from importing from F and levying r_{HF}

Figure 2.2

A Graphical Illustration of $\widetilde{r}_{HF}$

$l = 0.2$ $f = 0.25$



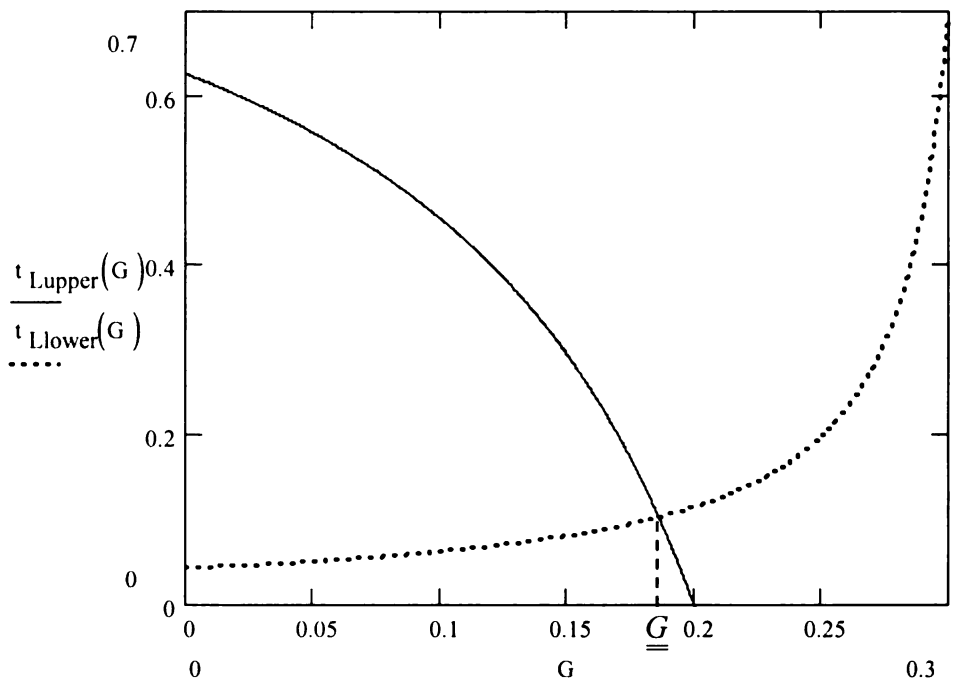
fromL(r) is H's social welfare from importing from L and levying r_{HL}

fromF(r) is H's social welfare from importing from F and levying r_{HF}

Figure 2.3

A Graphical Illustration of $\underline{\underline{G}}$

$l = 0.2$ $f = 0.25$

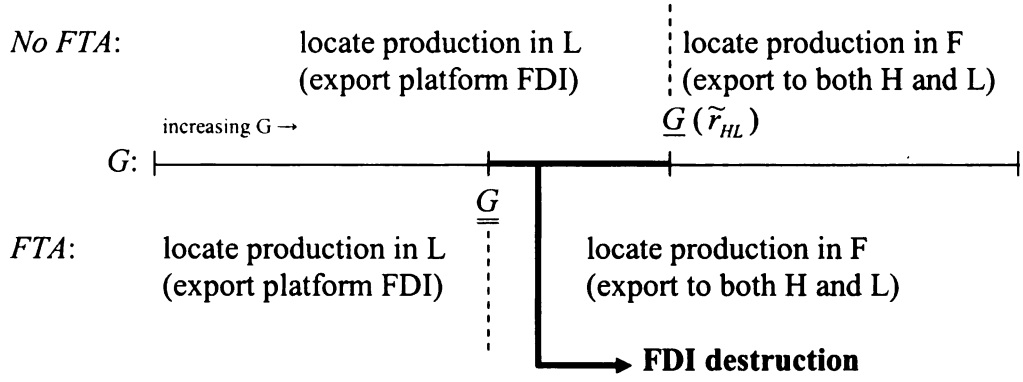


$t_{Lupper}(G)$ is $\overline{t_L}(G)$, the highest tax rate for which the firm will invest in L

$t_{Llower}(G)$ is $\underline{t_L}(G)$, the lowest tax rate for which L prefers to attract investment

Figure 2.4

Firm's equilibrium location decisions



Proposition 3. If $G \in (\underline{\underline{G}}, \underline{G}(\tilde{r}_{HL}))$, a FTA between H and L will cause FDI destruction.

CHAPTER THREE: PREFERENTIAL TRADE AGREEMENTS AND TAX COMPETITION WITH INTERNATIONALLY MOBILE FIRMS

1. Introduction

The connections between economic integration and tax competition have received considerable attention in recent years. Much of this attention is attributable to policy debates surrounding the formation and expansion of the European Union. Specifically, it is argued that economic integration has increased international capital mobility within the EU and may generate a "race to the bottom" in corporate income tax rates, as EU members compete for mobile capital. In response to such concerns, serious debate has emerged on the need for tax harmonization in the EU (see for example Sinn 1990, Cnossen 2003, McLure 2005).

In the standard models of tax competition for mobile capital (see Wilson 1999), a lower marginal tax rate levied by one region attracts capital to that region from other regions, thereby generating a negative fiscal externality (smaller tax base) for other regions. As a result, equilibrium tax rates are inefficiently low (and if taxes are used to finance local public goods, local public goods are underprovided). This result illustrates one concern surrounding the effect of economic integration on tax rates in the EU.

Devereux et al. (2002) present several stylized facts about the evolution of taxes in EU and G7 countries and claim that standard models of tax competition are inadequate to explain these stylized facts. They write, "The view that corporate income tax rates have fallen in response to increased mobility of capital, as countries compete to lower the

cost of capital within their own jurisdictions, is therefore not generally borne out by the data. An alternative possibility is that countries may instead compete for the activities of mobile multinational firms," (Devereux, et al. 2002, p. 542-543).

Zodrow (2003) reviews the tax competition literature in light of the debate over tax harmonization in the EU. He notes, "the basic tax competition model assumes a fixed capital stock in the union. This assumption is of course unwarranted to the extent that the union faces an elastic supply of capital," (Zodrow 2003, p. 656). In other words, standard tax competition models fail to incorporate competition for foreign direct investment (FDI) from outside the competing regions.

This paper develops a model of tax competition that incorporates competition for FDI from outside the competing regions. Two identical countries each have a fixed supply of labor, which produces a freely tradable intermediate good. This intermediate good is transformed into a final good by a fixed number of domestic firms, each of which earns positive profits. While the number of domestic firms in each country is fixed, the two identical countries face an elastic supply of firms from the rest of the world. If a firm from the rest of the world locates in one of the two countries, it is subject to that country's taxes, and repatriates its after-tax profits in units of the intermediate good. When there is no trade in the final good between the two identical countries or the rest of the world ("autarky" in this model), both countries choose a positive equilibrium taxes to exercise market power in the "market" for internationally mobile firms by taxing away some of the profits earned by firms locating within their borders. However, when the two identical countries form a preferential trade agreement (PTA) that allows trade in the final good between the two countries, but not with the rest of the world (that is, the two

identical countries move from "autarky" to "free trade"), tax competition for internationally-mobile firms from the rest of the world ensues, driving equilibrium taxes in both countries to zero.

The model presented in this chapter attempts to clarify the relationships between economic integration, tax competition, and foreign direct investment by multinational firms. Section 2 describes the model in more detail. Section 3 derives each country's equilibrium taxes in autarky. Section 4 considers integration in the form of a preferential trade agreement and its effect on equilibrium taxes. Section 5 concludes.

2. The Model

The basic setup of the model is similar to Krugman (1980). Firms in two identical countries, H and F, each produce a single variety of a differentiated final good. Equilibrium is analyzed both in the absence of trade in this final good (autarky), and when these two countries freely trade this final good with each other. This paper extends Krugman's model in three significant ways. First, whereas Krugman (1980) assumes free entry of domestic firms in each country, which serves to drive equilibrium profits of each firm to zero, this paper assumes that the residents of H and F each own a fixed number of domestic firms that is smaller than the number of firms that would exist if there were free entry, and thus each firm earns positive economic profits. Second, this paper introduces a third country, R (the rest of the world). Residents in R also own a fixed number of firms. Since the number of firms in each country is fixed and each firm earns positive economic profits, this opens up the possibility for foreign direct investment (FDI) in each country.

If internationally mobile firms owned by residents in R can earn a higher profit by locating in either H or F than they could from locating in R, they will do so. Third, whereas in Krugman (1980), labor is used to produce the differentiated product directly, in the current model, labor produces a freely tradable intermediate good using constant returns-to-scale technology. This intermediate good, then, is transformed by firms into differentiated final goods. The intermediate good serves an important role in this model. While firms are internationally mobile in this model, firm owners and labor are not. If firms owned by residents in R locate in either H or F and earn profits there, these firms must be able to repatriate their profits to the firm owners in R (who do not move with the firms to H or F). In the model, the intermediate good serve as the numeraire, and profits of R-owned firms are repatriated in units of the freely-tradable intermediate good.

Since H and F are identical, focus on the behavior of a representative consumer in H. A representative consumer derives utility from consuming varieties of the differentiated final good as represented by the utility function

$$U(c_1, \ldots, c_n) = \sum_{i=1}^{n} c_i^{\theta} \tag{1}$$

where c_i is the representative consumer's consumption of variety i, n is the number of varieties and is assumed to be large, and $\theta < 1$.The representative consumer maximizes her utility subject to a budget constraint

$$\sum_{i=1}^{n} p_i c_i \leq I \tag{2}$$

where p_i is the price of variety i and I is the representative consumer's income.

Solving the representative consumer's constrained optimization problem yields the demand for each variety i:

$$c_i = I\left(\frac{p_i}{\overline{P}}\right)^{\frac{1}{\theta-1}} \tag{3}$$

where

$$\overline{P} = \left(\sum_{i=1}^{n} p_i^{\frac{\theta}{\theta-1}}\right)^{\theta-1} \tag{4}$$

is an aggregate price index. A detailed derivation of (3) is provided in Appendix 1.

Given the demand for each variety (3), we can analyze the profit-maximizing behavior of firms in H to determine the price and quantity of each good. Labor (L) is used to produce a freely tradable intermediate good y according to the constant-returns-to-scale technology:

$$L = y \tag{5}$$

Normalize the total size of the population/labor force (L) in each country to 1 and let the price of the intermediate good be the numeraire. This, in turn, normalizes the wage rate to 1.

Each final good producing firm faces a fixed cost of production of α units of the intermediate good and a marginal cost of production of β units of the intermediate good. In other words, the cost of producing x_i units of the final good is:

$$y_i = \alpha + \beta x_i \tag{6}$$

With n identical firms, the market for the intermediate good clears when each firm receives $1/n$ units of the intermediate good. This fixes the output of each firm for a given number of firms.

$$x_i = \frac{1 - \alpha n}{\beta n} \tag{7}$$

Solving the following profit maximization problem faced by each firm will determine the equilibrium profit-maximizing price set by each firm.

$$\max_{x_i} p_i x_i - y_i$$

Having normalized the size of the population to 1, the final goods market clears when the quantity of each variety demanded by the representative consumer equals the quantity of output by each firm, or $c_i = x_i$. Solving the firm's profit maximization problem yields the profit-maxmizing price for each variety, which is a constant markup over marginal cost:

$$p_i = p = \frac{\beta}{\theta} \tag{8}$$

A detailed derivation of (8) is given in Appendix 2.

Since the equilibrium price for each firm is the same ($p_i = p$), the representative consumer's demand for each variety (3) reduces to:

$$c_i = \frac{I}{np} \tag{9}$$

That is, the representative consumer will spend a fraction $1/n$ of her income on each variety. Substituting the equilibrium price (8) into the representative consumer's demand (9) yields the profit maximizing quantity produced by each firm (since $c_i = x_i$):

$$x_i = \frac{\theta I}{\beta n} \tag{10}$$

Since the price of each variety of the differentiated final good (8) is the same, and each variety enter's the representative consumer's utility function (1) symmetrically, the representative consumer's indirect utility function is given by:

$$V = n\left(\frac{\theta I}{\beta n}\right)^{\theta} \tag{11}$$

That is, the representative consumer consumes an equal quantity (8) of each of n varieties of the differentiated final good.

To this point, we have neither specified nor solved for a value of n. To begin, let's derive the indirect utility-maximizing value of n. In order to do this, we need to derive the representative consumer's income as a value of n. The representative consumer's income consists of wage income (recall that the wage rate equals 1 due to the constant-returns-to-scale technology used to produce the freely tradable intermediate good, which serves as the numeraire) plus any profits generated by domestic firms. In other words, the representative consumer's income is given by:

$$I = l + \pi n \tag{12}$$

where π is the profit earned by each of n domestic firms. Since we know the price (8), quantity produced (9), and cost of production (6) for each firm, we can derive π as a function of n.

$$\pi = \frac{(1-\theta-\alpha n)}{\theta n} \tag{13}$$

First, note that the profit of each firm is decreasing in the number of firms. This is due to internal economies of scale. Because of the fixed costs of production and the limited supply of the intermediate good, the more firms there are, the smaller each firm is, moving each firm "up" its average total cost curve and reducing its profits. Also note that the zero-profit (free-entry) level of n is

$$n^{0} = \frac{1-\theta}{\alpha} \tag{14}$$

Substituting the profit of each firm (13) into the representative consumer's income (12) yields the representative consumer's income as a function of the number of firms:

$$I = \frac{(1-\alpha n)}{\theta} \tag{15}$$

Substituting this back into the representative consumer's indirect utility function (11) gives the representative consumer's indirect utility as a function of the number of firms:

$$V = n\left(\frac{1-\alpha n}{\beta n}\right)^{\theta} \tag{16}$$

Maximizing (16) with respect to n yields the indirect utility-maximizing number of firms:

$$n = \frac{1-\theta}{\alpha} = n^{0} \tag{17}$$

In other words, free entry will guarantee the efficient number of firms. This is a standard result in the Krugman (1980) model, which assumes an iso-elastic utility function identical to (1) and free entry of domestic firms.

In this model, however, we assume that the number of domestic firms in H is fixed below the number that would exist with free entry. That is, consider $n < \frac{1-\theta}{\alpha}$. In this case, domestic firms in H are earning positive economic profits, since from (12), if $n < \frac{1-\theta}{\alpha}$, then $\pi > 0$. If the profit earned by domestic firms in H is greater than the profit available in R (the rest of the world), internationally mobile firms from R have an incentive to locate in H. Attracting firms from R would have several important consequences for H. In autarky there is no trade in the final good, so the only way for consumers to access additional varieties is to attract internationally mobile firms from R.

Thus, the entry of firms from R would increase the number of domestically available varieties, which benefits consumers who are currently consuming an inefficiently low number of varieties. On the other hand, the entry of firms from R would reduce the profits of domestic firms (and in turn, the incomes of domestic consumers). Either way, the prospect of attracting firms from R opens the door for fiscal policy on the part of the government of H. The government of H may be willing to subsidize firms to increase the number of domestically available varieties, or may wish to tax firms to exercise market power over the profits that firms from R require to locate in H.

3. Equilibrium in Autarky

Consider H and F in autarky. That is, although the intermediate good is freely tradable between H, F and R, these countries do not engage in trade in the final good. H and F each have $n < \frac{1-\theta}{\alpha}$ domestic firms. Again, since H and F are identical, we will focus on H. Each firm in H is earning profits according to equation (13). In the rest of the world (R), firms earn a profit given by $\pi_R(N+N^*)$, where N is the number of R-owned firms that locate in H and N^* is the number of R-owned firms that locate in F. Although this generic profit function is exogenous to this model, a specific profit function with the properties of this function could be generated by a more specific model of the rest of the world. Just like the profits of domestic firms decrease as the number of firms increases, the profits of firms in R decreases with the number of firms in R. Thus, the more R-owned firms that locate in H or F (the fewer firms that remain in R), the higher the profits of the remaining R firms will be. In other words, $\pi_R' > 0$.

In order to influence the number of R-owned firms that locate in H, the government of H may levy a tax (subsidy) of $t > 0$ ($t < 0$) on firms that locate within its borders. To see the effects of a such a tax, first note that in equilibrium, the profit level in H (net of the tax) must equal the profit level in the rest of the world, $\pi_R(N+N^*)$. (Treat the policy of the government of R as exogenous.) This generates the following relationship between the size of the tax and the size (output) of each firm as follows:

$$px - (\alpha + \beta x) - t = \pi_R(N+N^*) \tag{18}$$

Equation (18) is an equal profit condition. It says that the after-tax profit of firms locating in H must equal the profit of firms remaining in R. Substituting the profit-maximizing price chosen by each firm (8) into (18) and solving for x and determines a relationship between the size of (quantity produced by) each firm (x), and the tax chosen by the government of H (t).

$$x = \frac{\theta(\pi_R(N+N^*)+\alpha+t)}{(1-\theta)\beta} \tag{19}$$

$$\frac{dx}{dt} = \frac{\theta}{(1-\theta)\beta}\left(\pi_R' \frac{dN}{dt} + 1\right) \tag{20}$$

Next, we need to determine the relationship between the tax and the number of R-owned firms choosing to locate in H. A cost to H of attracting R-owned firms is that R-owned firms use up domestic resources in H. Specifically, profits earned by R-owned firms are repatriated to firm owners in R in units of the intermediate good. This generates the following intermediate good market clearing condition:

$$(\alpha + \beta x)(N+n) = 1 - N \cdot \pi_R \tag{21}$$

The left-hand side of (21) shows the total intermediate good used by firms locating in the country (n domestic firms plus N R-owned firms), and the right-hand side shows the total

intermediate good available, after paying π_R for N foreign firms. Solving equation (21) for x determines a relationship between the size (output) of each firm (x), and the number of R-owned firms that locate in H (N).

$$x = \frac{1-\alpha(N+n)-N\pi_R}{\beta(N+n)} \tag{22}$$

Equation (18), or equivalently equation (19), is an "equal profit" (not zero profit) condition, which determines a relationship between x and t. Equation (21), or equivalently equation (22), is an intermediate good market clearing condition, which determines a relationship between x and N. Combining equation (22) with equation (19) determines the relationship between the tax chosen by the government of H (t) and the number of R-owned firms that locate in H (N).

$$\frac{(1-\theta)(1+n\pi_R)}{(N+n)} = \pi_R + \alpha + \theta t \tag{23}$$

$$\frac{dN}{dt} = -\frac{\theta(N+n)^2}{(1-\theta)(1+n\pi_R)+(N+n)(N+\theta n)\pi_R'} \tag{24}$$

Equation (24) shows that as the tax levied by H increases, the number of R-owned firms that will locate in H falls, or $\frac{dN}{dt} < 0$.

To determine the equilibrium level of the tax in H in autarky, the government of H maximizes the representative consumer's indirect utility function with respect to the tax. Solving this problem yields the following optimal tax formula for H in autarky:

$$t = N \cdot \pi_R' \tag{25}$$

The details of the derivation of (25) are provided in Appendix 3. The result in equation (25) is the familiar terms-of-trade effect. If $\pi_R(0) < \pi$, then $N > 0$ (firms will relocate from

R to H). Since H must pay profits to R-owned firms that locate in H, H is effectively "importing" firms from R at a "price" of π per firm. Since H can influence the price of these imports (R-owned firms' after-tax profits) through its choice of tax, H sets a positive "optimal tariff" (equilibrium tax). In other words, H uses a positive tax to exercise market power over the profits that R-owned firms must receive to locate in H.

Because H and F are identical, they face identical problems with respect to the entry of R-owned firms in autarky. Since H and F are identical, F will choose an equilibrium tax given by the formula $t^* = N^* \cdot \pi_R'$ where $N^* = N$ and therefore $t^* = t$. Thus, both H and F will choose positive taxes in autarky.

4. Equilibrium in a Preferential Trade Arrangement

What happens, however, if H and F form a preferential trade arrangement, but remain closed to final goods trade with R? That is, both the intermediate good and the differentiated final good are freely tradable between H and F, but only the intermediate good is tradable with R.

The following two conditions must be true in an equilibrium with firms in each country:

i) $px - (\alpha + \beta x) - t = \pi_R(N + N^*)$

ii) $p^*x^* - (\alpha + \beta x^*) - t^* = \pi_R(N + N^*)$

Condition i) says that given that N R-owned firms locate in H and N^* R-owned firms locate in F, the profits in H (net of the tax) must equal profits in the R. Condition ii) is equivalent for F.

Two facts are important to note. First, because there is free trade in the final good, the demand curve faced by each firm in the PTA is identical, regardless of the firm's choice to locate in H or F. Second, also because of free trade, the price of the intermediate good (the numeraire) is equalized in the PTA. Given these facts, each firm locating in the PTA, regardless of the country in which it locates , will choose the same price ($p = p^*$) and the same level of output ($x = x^*$) to maximize profits. Thus, we can rewrite i) and ii) as:

i') $px - (\alpha + \beta x) - t = \pi_R(N + N^*)$

ii') $px - (\alpha + \beta x) - t^* = \pi_R(N + N^*)$

Clearly if both i') and ii') are satisfied, $t = t^*$ in an equilibrium with preferential free trade and firms operating in both countries. Consider the alternatives. If $t > t^*$, the profits for firms locating in F are greater than the profits for firms locating in H, and thus any firm currently operating in H will relocate production to F. With no firms remaining in H, condition i') is irrelevant. Similarly, if $t < t^*$, all firms will locate in H, and ii') is irrelevant.

Consider for a moment that $t = t^* = N \cdot \pi'$ as in autarky. Is this a Nash equilibrium in taxes, or could the government of either H or F increase the indirect utility of the representative consumer in its country by deviating?

With preferential free trade, the indirect utility of the representative consumer in H is:

$$V = (N + n + N^* + n^*) \left[\frac{\theta I}{\beta(N + n + N^* + n^*)} \right]^{\theta} \qquad (25)$$

That is, the representative consumer in H is able to enjoy not only the $N + n$ domestically produced varieties, but also the $N^* + n^*$ varieties produced in F. What happens to the

number of varieties available to consumers in H if the government of H lowers its tax slightly below $t = N \cdot \pi'$? Nothing! While a reduction in taxes may influence the distribution of firms within the PTA, it does not affect the number of varieties available to consumers[8]. Note that regardless of the location of firms within the PTA, consumers in both H and F will be able to consume the varieties of final good produced by all firms in the PTA. That is, all FDI in the PTA will be export platform FDI, whereby the firm not only serves consumers in the host country, but also exports its good to consumers in the other country in the PTA.

To say that a reduction in a country's tax does not affect the number of varieties available to consumers is not to say that the reduction in taxes has no effect on consumers. The representative consumer's indirect utility is a function not only of the number of available varieties, but also of the representative consumer's income, which depends on the number of firms locating in that country (the country's tax base):

$$I = 1 + n \cdot \pi_R(N + N^*) + t \cdot (N + n) \tag{26}$$

While a small reduction in t given t^* does not have a significant effect on the number of varieties available to consumers in H, it does have a significant effect on the number of firms that actually locate in H. As described above, if H sets $t < t^*$, then the $N^* + n^*$ firms that previously operated in F will relocate to H, transforming equation (26) into

$$I = 1 + n \cdot \pi_R(N + N^*) + t \cdot (N + n + N^* + n^*) \tag{26'}$$

That is, a small reduction in t results in a doubling of the tax base in H, and thus an increase in the income that the representative consumer in H can spend on the available

[8] Actually, at this lower tax, some additional firms from R may now locate in H, but assume that for a small reduction in t, this is negligible.

varieties. This provides a strong incentive for the government of H to set t slightly below t^*.

Since H and F are identical, the government of F's incentive to set t^* slightly below t is equally strong. H and F will therefore compete in taxes a Bertrand-type fashion. This competition will cease when $t = t^* = 0$. If $t^* = 0$, it is straightforward to show that H's best response is to set $t = 0$, since for $t > 0$, all firms in the PTA will locate in F and H will not collect any positive tax revenue, but for $t < 0$, all firms in the PTA will locate in H, but the representative consumer's income is lower than if t were equal to zero. Thus, when H and F form a PTA, the Nash equilibrium in taxes is $t = t^* = 0$.

This result is reminiscent of Janeba (1998), wherein it is shown that in a Brander and Spencer (1985)-type model of two national oligopolists competing in a third market, each government has an incentive to subsidize its national firm in the absence of firm mobility, resulting in wasteful subsidy competition. However, when firms are internationally mobile, tax competition eliminates these wasteful subsidies. Janeba (1998) starts with free trade and shows that introducing international firm mobility eliminates government subsidies that would be chosen in the absence of firm mobility. In other words, firm mobility in the presence of free trade induces tax competition between competing regions. In contrast, the present model starts with international firm mobility and no trade in the final good, and shows that introducing preferential free trade eliminates government taxes that would be chosen in the absence of trade. In other words, preferential free trade in the presence of firm mobility induces tax competition between competing regions.

Despite these similarities, the welfare effects of tax competition in the two models stand in stark contrast. In Janeba (1998), the subsidies chosen in the absence of international firm mobility are welfare-reducing relative to the laissez-faire equilibrium generated by introducing firm mobility. That is, tax competition is welfare-improving. In the current model, the taxes chosen by the governments of H and F in the absence of a preferential trade agreement between the two countries are optimal (indirect utility maximizing) for each country. The tax competition induced by introducing trade in the final good between H and F generates a prisoner's dilemma for H and F; although retaining $t = t^* > 0$ as in autarky generates a higher level of indirect utility for the representative consumers in H and F than the Nash equilibrium $t = t^* = 0$, each government has an incentive to set a tax slightly lower than the other country to expand its tax base at the expense of the other country. Thus, in the presence of a FTA between H and F, when H and F set $t = t^* = 0$, more R-owned firms locate in the PTA than would have in the absence of a FTA, which is welfare-worsening for both H and F.

5. Conclusion

The model presented in this chapter extends existing models of economic integration and tax competition by incorporating internationally mobile firms from outside the integrating region. Whereas in standard tax competition models the motive for setting positive taxes is to finance a public good, the current model introduces an alternative motive for a country to set a positive tax: to exercise market power over the returns that internationally mobile firms require to locate in that country. Thus, in

autarky, governments set positive tax rates in equilibrium to lower the after-tax profits of firms locating within their borders, thereby limiting the entry of internationally mobile firms from the rest of the world. When two countries allow preferential free trade in the final good, both governments have incentives to lower their taxes to increase their tax bases, since they do not internalize the fiscal externality generated by their action. Thus, tax competition eliminates the positive taxes chosen by each country in autarky.

The intuition here is relatively straightforward. When two countries face an upward-sloping supply of foreign firms, the optimal tax is positive, since each country can use positive taxes to influence its "terms-of-trade" in firms (increasing the tax on firms effectively lowers the "price" a country must pay for "imported" firms)[9]. When the two countries integrate, however, each country can discontinuously increase the number of firms it attracts by lowering its tax by a small amount. In other words, preferential free trade introduces tax competition for internationally mobile firms from the rest of the world, which eliminates the "terms-of-trade" motivations for positive taxes in autarky.

[9] Note that this result depends crucially upon the assumption of market power of the two countries. From (25), if countries do not have market power in the "market" for internationally-mobile firms (if $\pi' = 0$), then countries do not have an incentive to set positive taxes in autarky.

APPENDICES

1. Deriving the representative consumer's demand for each variety

The first-order condition of the consumer's constrained optimization problem is:

$$\theta c_i^{\theta-1} - \lambda p_i = 0$$

where λ is the Lagrangian multiplier on the consumer's budget constraint.

$$c_i^{\theta-1} = \lambda p_i \theta^{-1}$$

$$(p_i c_i)^{\theta-1} = \lambda p_i^{\theta} \theta^{-1}$$

$$p_i c_i = \left(\frac{\lambda}{\theta}\right)^{\frac{1}{\theta-1}} p_i^{\frac{\theta}{\theta-1}}$$

$$\sum_{i=1}^{n} p_i c_i = \left(\frac{\lambda}{\theta}\right)^{\frac{1}{\theta-1}} \sum_{i=1}^{n} p_i^{\frac{\theta}{\theta-1}}$$

$$I = \left(\frac{\lambda}{\theta}\right)^{\frac{1}{\theta-1}} \sum_{i=1}^{n} p_i^{\frac{\theta}{\theta-1}}$$

$$I^{\theta-1} = \left(\frac{\lambda}{\theta}\right) \left(\sum_{i=1}^{n} p_i^{\frac{\theta}{\theta-1}}\right)^{\theta-1}$$

Define: $\overline{P} = \left(\sum_{i=1}^{n} p_i^{\frac{\theta}{\theta-1}}\right)^{\theta-1}$

$$\lambda = \frac{\theta I^{\theta-1}}{\overline{P}}$$

Substituting this back into the first-order condition yields:

$$c_i^{\theta-1} = \left(\frac{\theta I^{\theta-1}}{\overline{P}}\right) p_i \theta^{-1}$$

$$c_i = I \left(\frac{p_i}{\overline{P}}\right)^{\frac{1}{\theta-1}}$$

2. Deriving a representative firm's profit-maximizing price

A firm's profit maximization problem is given by:

$$\max_{x_i} \; p_i x_i - y_i$$

Substituting for p_i using the first-order condition from the representative consumer's constrained optimization problem (see Appendix 1) and remembering that $x_i = c_i$ in equilibrium (since $L = 1$), the firm's profit maximization problem becomes:

$$\max_{x_i} \left(\frac{\theta}{\lambda}\right) x_i^{\theta} - (\alpha + \beta x_i)$$

The first-order condition of the firm's profit maximization problem is:

$$\theta\left(\frac{\theta}{\lambda}\right) x_i^{\theta-1} - \beta = 0$$

$$\theta p_i = \beta$$

$$p_i = \frac{\beta}{\theta}$$

3. Deriving the equilibrium tax in autarky

The representative consumer's indirect utility function in autarky is:

$$V = (N+n)x^{\theta}$$

Maximizing this with respect to the tax levied by H (t) yields:

$$\frac{dV}{dt} = \frac{dN}{dt}x^{\theta} + \theta(N+n)x^{\theta-1}\frac{dx}{dt} = 0$$

$$\frac{dN}{dt}x = -\theta(N+n)\frac{dx}{dt}$$

$$\frac{dN}{dt}x = -\frac{\theta^2(N+n)}{(1-\theta)\beta}\left(\pi_R'\frac{dN}{dt}+1\right)$$

$$\frac{dN}{dt}\left(x+\frac{\theta^2(N+n)\pi_R'}{(1-\theta)\beta}\right) = -\frac{\theta^2(N+n)}{(1-\theta)\beta}$$

$$\frac{dN}{dt}\left(\frac{\theta(\pi_R+\alpha+t)}{(1-\theta)\beta}+\frac{\theta^2(N+n)\pi_R'}{(1-\theta)\beta}\right) = -\frac{\theta^2(N+n)}{(1-\theta)\beta}$$

$$\frac{dN}{dt}\left(\pi_R+\alpha+t+\theta(N+n)\pi_R'\right) = -\theta(N+n)$$

$$\frac{dN}{dt} = -\frac{\theta(N+n)}{\pi_R+\alpha+t+\theta(N+n)\pi_R'}$$

$$-\frac{\theta(N+n)^2}{(1-\theta)(1+n\pi_R)+(N+n)(N+\theta n)\pi_R'} = -\frac{\theta(N+n)}{\pi_R+\alpha+t+\theta(N+n)\pi_R'} \quad \text{[from (24)]}$$

$$\pi_R+\alpha+t+\theta(N+n)\pi_R' = \frac{(1-\theta)(1+n\pi_R)}{(N+n)}+(N+\theta n)\pi_R'$$

$$\pi_R+\alpha+t+\theta(N+n)\pi_R' = \pi_R+\alpha+\theta t+(N+\theta n)\pi_R' \quad \text{[from (23)]}$$

$$(1-\theta)t = (1-\theta)N\pi_R'$$

$$t = N\cdot\pi_R'$$

REFERENCES

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Baltagi, Badi H., Peter Egger, and Michael Pfaffermayr, 2005. Estimating Models of Complex FDI: Are There Third-Country Effects? Working Paper. Texas A&M University, University of Munich, and University of Innsbruck.

Bernard, Andrew B., J. Bradford Jensen, and Peter K. Schott, 2005. Importers, Exporters, and Multinationals: A Portrait of Firms in the US that Trade Goods. Working Paper 05-10. Peter G. Peterson Institute for International Economics.

Blonigen, Bruce A., 2005. A Review of the Empirical Literature on FDI Determinants. Working Paper #11299. National Bureau of Economic Research.

Blonigen, Bruce A., Ronald B. Davies, Glen R. Waddell, and Helen T. Naughton, 2004. FDI in Space: Spatial Autoregressive Relationships in Foreign Direct Investment. Working Paper #10939. National Bureau of Economic Research.

Brainard, S. Lael, 1997. An Empirical Assessment of the Proximity-Concentration Trade-off Between Multinational Sales and Trade. *American Economic Review* 87, 520 – 544.

Brander, J.A. and B.J. Spencer, 1985. Export Subsidies and International Market Share Rivalry. *Journal of International Economics* 18, 83 – 100.

Brander, James A. and Barbara J. Spencer, 1987. Foreign direct investment with unemployment and endogenous taxes and tariffs. *Journal of International Economics* 22, 257 – 279.

Carr, David L., James R. Markusen, and Keith E. Maskus, 2001. Estimating the Knowledge-Capital Model of the Multinational Enterprise. *American Economic Review* 91, 693 – 708.

Caves, Richard E., 1982. *Multinational enterprise and economic analysis*. Cambridge UP, Cambridge.

Cnossen, Sijbren, 2003. How much Tax Coordination in the EU? *International Tax and Public Finance* 10, 625 – 649.

Cook, Nathaniel P.S., 2006. Comment on "Preferential trade agreements and tax competition for foreign direct investment". Manuscript. Michigan State University.

Davis, Donald R. and David E. Weinstein, 2001. Market Size, Linkages, and Productivity: A Study of Japanese Regions. Working Paper #8518. National Bureau of Economic Research.

Devereux, Michael P., Rachel Griffith, and Alexander Klemm, 2002. Corporate income tax reforms and international tax competition. *Economic Policy* 17, 450 – 494.

Ekholm, Karolina, Rikard Forslid, and James R. Markusen, 2003. Export Platform Foreign Direct Investment. Working Paper #9517. National Bureau of Economic Research.

Gronau, Reuben, 1974. Wage Comparisons – A Selectivity Bias. *Journal of Political Economy* 82, 1119 – 1143.

Hanson, Gordon H., Raymond J. Mataloni, Jr., and Matthew Slaughter, 2001. Expansion Strategies of US Multinational Firms, in Collins, S.M. and Dani Rodrik (Eds.), *Brookings Trade Forum: 2001*. Brookings Institution Press, Washington D.C., 245 – 294.

Hanson, Gordon H., Raymond J. Mataloni, Jr., and Matthew Slaughter, 2003. Vertical Production Networks in Multinational Firms. Working Paper #9723. National Bureau of Economic Research.

Harris, Chauncey D., 1954. The Market as a Factor in the Localization of Industry in the United States. *Annals of the Association of American Geographers* 44, 315 – 348.

Head, Keith and Thierry Mayer, 2004. Market Potential and the Location of Japanese Investment in Europe. *Review of Economics and Statistics* 86, 959 – 972.

Heckman, James J., 1979. Sample Selection Bias as a Specification Error. *Econometrica* 47, 153 – 161.

Helpman, Elhanan, 1984. A Simple Theory of International Trade with Multinational Corporations. *Journal of Political Economy* 92, 451 – 471.

Helpman, Elhanan, and Paul R. Krugman, 1985. *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy.* MIT Press, Cambridge, MA.

Helpman, Elhanan, Marc Melitz, and Yona Rubinstein, 2004. Trading Partners and Trading Volumes. Manuscript. Harvard University.

Hwang, Hong and Chao-cheng Mai, 2002. The tariff-jumping argument and location theory. *Review of International Economics* 10, 361 – 368.

Motta, Massimo and George Norman, 1996. Does Economic Integration Cause Foreign Direct Investment? International Economic Review 37, 757 – 783.

Janeba, Eckhard, 1998. Tax competition in imperfectly competitive markets. *Journal of International Economics* 44, 135 – 153.

Krugman, Paul, 1980. Scale Economies, Product Differentiation, and the Pattern of Trade. *American Economic Review* 70, 950 – 959.

Markusen, James R., 1984. Multinationals, Multi-Plant Economies, and the Gains from Trade. *Journal of International Economics* 16, 205 – 226.

Markusen, James R. and Anthony J. Venables, 2000. The Theory of Endowment, Intra-Industry, and Multi-national Trade. *Journal of International Economics* 52, 209 – 234.

Motta, Massimo, 1992. Multinational firms and the tariff-jumping argument. *European Economic Review* 36, 1557 – 1571.

Motta, Massimo and George Norman, 1996. Does economic integration cause foreign direct investment? *International Economic Review* 37, 757-783.

McLure, Charles E., Jr., 2005. The European Commission's Proposals for Corporate Tax Harmonization. *CESifo Forum*, 32 – 41.

Neary, J. Peter, 2002. Foreign Direct Investment and the Single Market. *Manchester School* 70, 291 – 314.

Raff, Horst, 2004. Preferential trade agreements and tax competition for foreign direct investment. *Journal of Public Economics* 88, 2745 – 2763.

Shatz, Howard J. 2004, US Multinational Affiliate Exports from Developing Countries. *Journal of Economic Geography* 4, 323 – 344.

Sinn, Hans-Werner, 1990. Tax Competition and Tax Coordination in Europe. *European Economic Review* 34, 489 – 504.

United Nations Conference on Trade and Development (UNCTAD), 2000. Tax Incentives and Foreign Direct Investment: A Global Survey. *ASIT Advisory Studies* 16. United Nations, New York, NY.

Vousden, Neil, 1990. *The economics of trade protection*. Cambridge: Cambridge University Press, 122-126.

Wilson, John D., 1999. Theories of Tax Competition. *National Tax Journal* 52, 269 – 304.

Wooldridge, Jeffrey M., 2002. *Econometric Analysis of Cross Section and Panel Data.* MIT Press, Cambridge, MA.

Yeaple, Stephen R., 2003. The Role of Skill Endowments in the Structure of US Outward Foreign Direct Investment. *Review of Economics and Statistics* 85, 726 – 734.

Zodrow, George R., 2003. Tax Competition and Tax Coordination in the European Union. *International Tax and Public Finance* 10, 651-671.