Essays on foreign direct investments and preferential trade agreements

by

Norikatsu Hiraide

B.A., Keio University, 2010

M.S., Emporia State University, 2013

M.A., Kansas State University, 2017

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the
requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Economics
College of Arts and Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2021

Abstract

This dissertation consists of three essays. The first essay investigates the importance of preferential trade agreement (PTA) formation in attracting inflows of foreign direct investment (FDI). In particular, we examine the heterogeneous effects of different types of PTAs (FTAs or CUs) on the extensive and intensive margins of FDI and on how the interdependence among various PTAs may affect a country's ability to attract FDI inflows. We find that the larger the preferential markets to which a country has access, the larger the FDI inflows the country receives. Furthermore, we find that the type of PTA matters in determining FDI inflows. In this case, we find that the formation of CUs tends to promote FDI inflows more than the formation of FTAs. Our findings also indicate that the formation of PTAs significantly affects FDI through the intensive margin rather than through the extensive margin. Importantly, notice that these effects are driven by the preferential markets to which a country has access and that have not established a PTA with the FDI-originating (home) country, confirming that PTA interdependence matters in determining FDI inflows.

The second essay examines the effects of U.S. exposure to international trade in goods and services on U.S. local labor markets. The paper finds that the average increase in U.S. exposure to FDI inflows increases the share of manufacturing employment, while the average increase in U.S. exposure to FDI outflows reduces the share of manufacturing employment in the U.S. local labor markets. Overall, the average increase in U.S. exposure to international trade in goods and services is associated with a 0.049 percentage point increase in the share of manufacturing employment from 1991 to 2007. We quantify the employment impact and find that the implied employment changes due to U.S. exposure to international trade in goods and services are about 1.36 million over the period 1991-2007. The paper also investigates the employment and wage effects of U.S. exposure to international trade in goods and services and finds the positive net employment and wage effects from 1991 to 2007.

The third essay investigates the effects of the formation of PTAs on different FDI strategies, including vertical, horizontal, and export-platform FDI. In addition, we examine heterogeneous effects of different types of PTAs (FTAs or CUs) on the intensive and extensive margins of each type of FDI and on how the interdependence among various PTAs may affect a host country's ability to attract each type of FDI. We find that a host country enlarging preferential markets through the formation of PTAs with other economic partners promotes the U.S. multinationals' horizontal and export-platform FDIs. On the other hand, a host country forming a PTA with the U.S. receives more vertical FDI. Also, we find that the formation of CUs tends to promote horizontal and export-platform FDI more than the formation of FTAs. Moreover, our results show that U.S. multinationals increase each type of FDI through the intensive margin of FDI.

Essays on foreign direct investments and preferential trade agreements

by

Norikatsu Hiraide

B.A., Keio University, 2010

M.S., Emporia State University, 2013

M.A., Kansas State University, 2017

A DISSERTATION

submitted in partial fulfillment of the
requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Economics
College of Arts and Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2021

Approved by:

Major Professor
Peri da Silva

Copyright

© Norikatsu Hiraide 2021.

Abstract

This dissertation consists of three essays. The first essay investigates the importance of preferential trade agreement (PTA) formation in attracting inflows of foreign direct investment (FDI). In particular, we examine the heterogeneous effects of different types of PTAs (FTAs or CUs) on the extensive and intensive margins of FDI and on how the interdependence among various PTAs may affect a country's ability to attract FDI inflows. We find that the larger the preferential markets to which a country has access, the larger the FDI inflows the country receives. Furthermore, we find that the type of PTA matters in determining FDI inflows. In this case, we find that the formation of CUs tends to promote FDI inflows more than the formation of FTAs. Our findings also indicate that the formation of PTAs significantly affects FDI through the intensive margin rather than through the extensive margin. Importantly, notice that these effects are driven by the preferential markets to which a country has access and that have not established a PTA with the FDI-originating (home) country, confirming that PTA interdependence matters in determining FDI inflows.

The second essay examines the effects of U.S. exposure to international trade in goods and services on U.S. local labor markets. The paper finds that the average increase in U.S. exposure to FDI inflows increases the share of manufacturing employment, while the average increase in U.S. exposure to FDI outflows reduces the share of manufacturing employment in the U.S. local labor markets. Overall, the average increase in U.S. exposure to international trade in goods and services is associated with a 0.049 percentage point increase in the share of manufacturing employment from 1991 to 2007. We quantify the employment impact and find that the implied employment changes due to U.S. exposure to international trade in goods and services are about 1.36 million over the period 1991-2007. The paper also investigates the employment and wage effects of U.S. exposure to international trade in goods and services and finds the positive net employment and wage effects from 1991 to 2007.

The third essay investigates the effects of the formation of PTAs on different FDI strategies, including vertical, horizontal, and export-platform FDI. In addition, we examine heterogeneous effects of different types of PTAs (FTAs or CUs) on the intensive and extensive margins of each type of FDI and on how the interdependence among various PTAs may affect a host country's ability to attract each type of FDI. We find that a host country enlarging preferential markets through the formation of PTAs with other economic partners promotes the U.S. multinationals' horizontal and export-platform FDIs. On the other hand, a host country forming a PTA with the U.S. receives more vertical FDI. Also, we find that the formation of CUs tends to promote horizontal and export-platform FDI more than the formation of FTAs. Moreover, our results show that U.S. multinationals increase each type of FDI through the intensive margin of FDI.

Contents

List of Figures

List of Tables

Acknowledgments

Throughout the writing of this dissertation, I have received a great deal of support and assistance.

First, I would like to express my deepest gratitude to my advisor Professor Peri da Silva for his generous help, patience, and encouragement in every stage of my Ph.D. research. I would not have completed this dissertation without his excellent academic support and profound belief in my work.

In addition to serving on my dissertation committee, I owe my deepest gratitude to Dr. Leilei Shen. As a co-author of my dissertation projects, she gave me tremendous support and valuable advice in developing my research. I am also deeply thankful to my committee members, Dr. Lance Bachmeier, Dr. Ansley Chua, and Dr. Nelson Villoria, for their feedback on my work, professionalism, and availability throughout this process. Also, special thanks to my outside chair, Dr. Ansley Chua, for his valuable time.

I would also like to extend my sincere thanks to William Blankenau, Steven Cassou, Yang-Ming Chang, Philip Gayle, Yoon-Jin Lee, and the rest of the Department of Economics faculty for their excellence in teaching and mentoring, and to Courtney, Crystal, and Susan for their continuous support. Thanks to all of them, I have gained invaluable educational expericences.

I am indebted to my wife, Chikako Hiraide, who has been extremely supportive of me throughout this entire process. Without your constant support, I couldn't have made it this far.

To my parents, sister, brother, uncle, aunt, and grandparents, I would like to extend my gratitude for their love and support. They have always been there to support and encourage me. To all my friends and colleagues, I very much appreciate your great support. All of you made my graduate school life enjoyable and memorable.

Dedication

To my parents, Keiko and Teruo Hiraide
To my wife, Chikako Hiraide

Chapter 1

The Importance of Heterogeneity in Determining the Effects of Preferential Trade Agreements on FDI

1.1 Introduction

The number of preferential trade agreements (PTAs) in force has grown rapidly and, according to the World Trade Organization (WTO), reached 337 as of January 2021.[1] Every WTO member participates in at least one PTA, while some WTO members participate in as many as 40 different PTAs. The number of agreements has more than quintupled since the start of the WTO in 1995, implying that, on average, the world has become more integrated due to multilateral and preferential trade-liberalization efforts. More importantly, PTAs take different forms; more than 90% of the current agreements take the form of Free

[1] This number does not include unilateral trade agreements created under the Enabling Clause, where developed countries grant preferential access to developing countries. Moreover, it does not double-account agreements that enable preferential access involving goods as well as services. Finally, inactive agreements have been purged from this number as well. Find more information at https://www.wto.org/english/tratop_e/region_e/region_e.htm.

Trade Areas (FTAs) or other partial-scope agreements, while the remainder takes the form of Customs Unions (CUs).[2] The distinction between FTAs and CUs is important because FTAs provide member countries more flexibility in tariff setting by allowing them to set different external tariffs, while CUs require member countries to adopt a common external tariff. The world economic-integration process sponsored by the WTO, as well as by its predecessor agreement, the General Agreement on Tariffs and Trade (GATT), has undoubtedly promoted trade in goods, but it has also promoted trade in services through the General Agreement on Trade in Services (GATS). Foreign Direct Investment (FDI) represents an important mode of trade in services. Since the formation of the WTO, worldwide FDI had increased fivefold by 2016.[3] In particular, the activities of the U.S. multinational firms also multiplied, and, by 2012, their foreign affiliate aggregate sales had more than quadrupled since 1995, reaching about US$5.9 trillion. The data suggest that this substantial increase in multinational activity hides significant sources of heterogeneity across countries. In fact, while some countries have faced massive increases in FDI inflows, others may have faced much smaller increases. For example, Ireland and Luxembourg enjoyed a dramatic increase in U.S. multinational affiliate sales of 1141% and 1396%, respectively, while Portugal and Spain experienced a visibly smaller increase in U.S. multinational affiliate sales of 56% and 97% between 1995 and 2012, respectively.[4]

This paper investigates the sources of heterogeneous effects of PTA formation in attracting FDI inflows considering the market potential of a country, a concept first introduced by Harris (1954). In this case, market potential includes not only the size of the FDI recipient country's economy but also includes the markets to which the recipient can access on a preferential basis. Our intuition suggests that the larger the preferential markets to which a country has access, the larger the FDI inflows the country receives. As such, our

[2] According to the World Trade Organization, 94.9% of the PTAs take the form of FTAs or other limited scope agreements, while 5.1% of the PTAs take the form of CUs.

[3] Source: UNCTADSTAT foreign direct investment data (http://unctadstat.unctad.org/EN/)

[4] In Asia, China and India experienced the largest and second-largest increases in U.S. multinational affiliates sales, with increases of 4230% and 3714%, respectively, during a similar time frame. On the other hand, Malaysia, Philippines, and Japan experienced relatively smaller increases of 273%, 237%, and 125%, respectively.

paper's main contributions can be summarized in the following four points. First, we use the data from 1983 to 2012 to account for the PTA formation processes during the 2000s, a time period that has witnessed the largest proliferation in the formation of PTAs in all regions of the world. Second, we distinguish a country's market potential based on the type of PTAs (FTAs and CUs) that it has formed with other countries. This distinction allows us to examine the heterogeneous effects of different types of PTAs (FTAs or CUs) on FDI inflows.[5]

Third, we examine the effects of different types of PTAs on the intensive and extensive margins of FDI. Lastly, we control for the presence of specific hub-and-spoke PTAs in which the preferential markets that a country has access to and the FDI-sourcing (home) country also have a PTA in place.

In the benchmark results, we measure FDI by the sales of the U.S. multinational affiliates in 48 countries from 1983 to 2012. We use data from the Bureau of Economic Analysis (BEA) on U.S. multinational foreign affiliate sales, organized by the SIC-based International Surveys Industry (ISI) codes before 1999, and organized by the NAICS-based ISI codes after 1999. We utilize PTA formation data from Baier, Bergstrand, and Feng (2014). Our main result shows that, on average, the larger the preferential markets to which a country has access, the larger the FDI inflows the country receives. These results are economically relevant since a one-standard-deviation increase in the measure of preferential market integration ("weight of host" in the methodology section) is associated with an increase of about US$51.1 billion in FDI inflows. This empirical result implies that PTAs enlarge a member country's market by providing multinational firms access to other preferential markets.

[5]Previous international trade literature investigates the heterogeneous effects of PTA type on trade flows. Magee (2008) shows that a CU has greater and long-lasting impacts on intra-bloc trade than an FTA does. He finds that while FTAs and CUs have similar impacts on trade after seven years into force, by the 18th year, the effect of a CU on trade is nearly double that of an FTA. Also, Roy (2010) shows that members of a CU engage in significantly greater volumes of bilateral trade than FTA members even after controlling for a separate EU effect. As for the effects of PTAs on FDI, Motta and Norman (1996) show that economic integration, such as NAFTA, EU, and ASEAN, will induce outside firms to invest in the integrated regional bloc by improving market accessibility. Later, Ekholm et al. (2007) show that multinationals located in a free trade area tend to engage in export-platform FDI. Instead of investigating the effect of a single type of PTA, our paper investigates the heterogeneous effects of different types of PTAs (i.e., FTAs and CUs) on FDI using the idea of the market potential of a host country.

However, this important average effect of PTA formation on FDI inflows still confounds multiple policy-relevant sources of heterogeneity. In particular, we investigate the channels through which the type of PTA (FTA vs. CU), the margins of FDI inflows, and the interdependence among PTAs come together to shape the average effect of PTAs on FDI inflows. Interestingly, we conclude that the establishment of CUs tends to promote FDI inflows more than the establishment of FTAs. In this case, we find that the formation of CUs increases FDI inflows by US$14.9 billion more than the formation of FTAs. Furthermore, we find that the formation of PTAs significantly affects FDI through the intensive margin rather than through the extensive margin. Importantly, however, these average effects of market potential on FDI inflows are driven by the exchange of preferential access with partners that do not have a PTA with the same FDI-originating (home) country. This result confirms that interdependence among PTAs also matters in a country's ability to attract FDIs.

We also perform various robustness checks and find that our benchmark results remain qualitatively the same. First, we consider an alternative definition of FDI that measures the stock of foreign capital owned by multinationals from eight different originating countries, including the U.S. These robustness tests rely on the OECD's FDI stock database, and all results are robust to this alternative dataset. Second, the paper also considers an alternative econometric approach, based on first differencing of the data over five years, to account for the full impact of PTAs on FDI, similar to the method used in Bergstrand, Baier, and Feng (2014). In addition, we employ an instrumental variable (IV) methodology, which relies on using the predicted market potential to account for the potential endogeneity bias of PTA formation. Our results are robust to these alternative specifications and to others outlined in the main text that controls for the type of PTAs and for the margin of FDI. Last, we extend our definition of PTAs also to include partial-scope agreements and show that our results are only driven by the formation of full-fledged agreements in the form of FTAs and CUs.[6]

[6]This finding resembles Ornelas and Liu's (2014) conclusion that partial-scope PTAs do not increase the longevity of democratic regimes. Different from full-fledged PTAs, partial-scope PTAs can represent partial liberalization in terms of industry coverage and degree of liberalization within an industry. Furthermore, partial-scope PTAs may not represent a lasting commitment to significant preferential liberalization. As such, their effects on trade in goods and services can be very limited relative to full-fledged PTAs. See also

This paper contributes to the literature on the effects of PTAs on FDI. Bagwell, Bown, and Staiger (2016) argue that these two trends may be related since the formation of PTAs can better address deeper forms of economic integration (e.g., economic standards and property rights) than multilateral negotiations can. This argument provides a channel through which PTA formation may be related to FDI activity. Likewise, Blanchard and Matschke (2015) show that the greater the degree of U.S. multinational activities in a particular country, the greater the incentives for U.S. policymakers to improve the market access granted by the U.S. economy to these U.S. foreign affiliate firms. These papers suggest the need to study the relationship between PTA formation and FDI flows.

In general, the effects of the formation of PTAs have been investigated in several fronts. In the field of international trade, various papers have examined the effects of PTA formation on bilateral trade volumes, using the well-known gravity model. Baier and Bergstrand (2007) find that the effects of the formation of PTAs on trade flows are five times as large as traditional estimates suggest, after controlling for endogeneity bias of PTA formation. Baier, Bergstrand, and Feng (2014) use a similar gravity model and find significant heterogeneous effects of PTA formation related to type (FTAs or CUs) on the intensive margin and the extensive margin of trade.[7] Furthermore, Deltas, Desmet, and Facchini (2012) show theoretically and empirically that the formation of an additional FTA by a member of an existing one may promote trade between the two original FTA partners. Their result highlights that the effects of PTA formation are interdependent, which strongly relates to our finding that enlarging market potential through PTA formation depends on additional agreements that involve preferential partners. Egger and Larch (2008) show that the formation of a PTA between two countries depends not only on their economic characteristics (country-pair size, country-pair asymmetry, distance, etc.) but also on the share of other trade partners belonging to PTAs. This result confirms the inherent interdependent nature of PTAs.

Likewise, several efforts have been undertaken to investigate the effects of trade costs on FDI. In theoretical terms, Markusen (1984) develops a general equilibrium model to

Baier, Bergstrand, and Feng (2014) for a comparison of the trade flow effects between these PTA groups.

[7] Baier, Bergstrand, and Feng (2014) use the methodology introduced in Hummels and Klenow (2005) to define the intensive and extensive margins of trade.

explain a multinational firm's Horizontal FDI decision to avoid tariffs and other trade costs. Helpman (1984) also develops a general equilibrium model to explain the coexistence of inter-sectoral trade, intra-industry trade, and intra-firm trade. Later, Helpman, Melitz, and Yeaple (2004) rely on an extension of Melitz's (2003) firm heterogeneity model to investigate the choice between exports and Horizontal FDI. They conclude that only the most productive exporting firms should become multinationals and provide empirical evidence supporting this contention.[8]

The importance of FDI inflows is not restricted to merely increasing income by increasing investment levels in the recipient[9] economy. FDI is one of the most critical policy-agenda items because it may have positive spillovers on the productivity of domestic firms, creating above-normal returns to the recipient economy. Javorcik (2004) shows that FDI in Lithuania has had positive productivity spillovers on domestic suppliers, using firm-level data from 1996 to 2000. Likewise, Arnold, Javorcik, and Mattoo (2011) examine the link between service-sector liberalization in the Czech Republic and the productivity of manufacturing industries in that country, using firm-level data from 1998 to 2003. Their paper finds that service-sector liberalization allowing for more FDI leads to an increase in the productivity of firms in downstream manufacturing sectors.

The remainder of this paper is organized as follows. Section 2 discusses the empirical methodology, which includes the econometric model and the description of the main variables. Section 3 describes the data used in the analysis. Sections 4 and 5 provide the main econometric results and the results from the robustness tests, respectively. Section 6 concludes the paper.

[8]Other important contributions are part of this literature. For instance, Yeaple (2003) develops a three-country model to explain multinational enterprises' complex integration strategy where they engage in both vertical FDI and horizontal FDI. Grossman, Helpman, and Szeidl (2006) develop a model to explain the choice among Horizontal FDI, Vertical FDI, and Export-platform FDI.

[9]We will use the terminology "recipient" and "host" country/economy interchangeably throughout the paper.

1.2 Methodology

This paper investigates the role that PTA formation plays in determining FDI inflows. In particular, it explores whether the formation of PTAs enlarges the market potential of a host country, a concept introduced initially by Harris (1954), and derived theoretically in Krugman (1992). Later on, Mayer and Head (2004) and Hanson (2005) empirically test the validity of the market potential concept. In our paper, we follow the specification of market potential introduced by Chen (2009), which incorporates the formation of PTA into the market potential variable. In addition, we allow for the heterogeneous effects of market potential constructed based on the different types of PTAs (FTAs and CUs), as well as controlling for heterogeneous effects due to the presence of PTAs involving a host country's preferential partner and the same FDI-sourcing country. Moreover, we examine the effects of the market potential on the intensive and extensive margins of FDI. The following expression describes our baseline specification:

$$FDI_{us,it} = \beta_0 + \beta_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it}, \tag{1.1}$$

where $FDI_{us,it}$ stands for the U.S. multinational foreign affiliate sales in host country i at year t, X_{it} is a vector with host country i's characteristics at year t, including corporate tax, GDP per capita, the presence of a preferential trade agreement between the U.S. and the host country i, the presence of a preferential trade agreement between the host country i and another country j, and the number of host country i's PTA memberships. ψ_i and μ_t are host country i and year fixed effects, respectively.[10] ϵ_{it} is the error term. Robust standard errors are reported for all regressions involving the U.S. multinational foreign affiliate sales.[11]

M_{it} is the main variable of interest in this study, and it represents the market potential

[10]Notice that time-invariant characteristics are absorbed by the host country fixed effects ψ_i. In addition, the host country's capital-labor ratios are proxied by the host country's GDP per capita, while the U.S. capital-labor ratios are controlled for by the year fixed effects μ_t.

[11]The number of clusters is too small to allow for estimated errors clustered at the country level when using U.S. multinational foreign affiliate sales regressions. Later, in the robustness tests using OECD's FDI stock data for 8 home countries and 48 host countries, we cluster at home-host country level. Our results are not qualitatively affected by this alternative specification.

of host country i at year t. This variable is defined to control for the additional market access that a U.S. multinational enjoys due to the host country i's preferential access to other relevant markets. Following Chen (2009), this key variable is then defined according to the following expression:

$$\begin{aligned} M_{it} &\equiv \text{Market Potential of country } i \text{ at year t} \\ &= \underbrace{\omega_0 Y_{it}}_{\text{host country } i \text{ market size}} + \underbrace{\omega_1 \left(PTA_{us,it} * \frac{Y_{us,t}}{\tau_{us,i}} \right)}_{\text{weight of U.S.}} + \underbrace{\omega_2 \sum_{j \neq us,i} \left(PTA_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of host}} \\ &+ \underbrace{\omega_3 \sum_{j \neq i} \left((1 - PTA_{ijt}) * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of ROW}}, \end{aligned} \tag{1.2}$$

where Y_{it}, $Y_{us,t}$, and Y_{jt} represent the market size of the host country i, the market size of the U.S., and the market size of another country j, respectively. $PTA_{us,it}$ is a binary variable that equals one if the U.S. and the host county i have a preferential trade agreement in place at year t, and zero otherwise; while PTA_{ijt} also represents a binary variable that identifies whether host country i and country j have a preferential trade agreement in year t. Variables $\tau_{us,i}$ and τ_{ij} represent transportation costs between the U.S. and the host country i, and the transportation cost between country i and j, respectively.

Our main variable of interest (M_{it}) captures the effects of the host country i's market potential on FDI inflows, and its effects can be disentangled into four important components. The first term, $\omega_0 Y_{it}$, captures the market size of the host country i. The second term, $\omega_1 \left(PTA_{us,it} * \frac{Y_{us,t}}{\tau_{us,i}} \right)$, captures the U.S. market size. We shall, therefore, refer to it as the "weight of U.S.". Similarly, the third term, $\omega_2 \sum_{j \neq us,i} \left(PTA_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right)$, and the fourth term, $\omega_3 \sum_{j \neq i} \left((1 - PTA_{ijt}) * \frac{Y_{jt}}{\tau_{ij}} \right)$, reflect the market size of other countries that country i has a PTA with, and the rest-of-the-world's market size respectively. We shall, therefore, label the third term "weight of host" and the fourth term "weight of ROW".

The parameters to be estimated in the paper are ω_0, ω_1, ω_2, and ω_3. Coefficient ω_0

captures the effects of the host country i's market size, ω_1 captures the effect of the presence of a PTA between the host country i and the U.S., ω_2 captures the effects of host country i's PTAs with countries other than the U.S., while coefficient ω_3 captures the effects of the presence of PTAs not involving the host country i. The importance of each component in variable M_{it} is weighted by the relative size of host country i's trading partners while controlling for the relevant transportation costs.

An important question is whether additional PTAs involving a host country's preferential trade partner(s) and the home country (the U.S. in our baseline model) may hinder the host country's ability to attract FDI inflows through the formation of PTAs. The literature has offered related theoretical reasons and empirical evidence to conclude that the formation of a PTA involving a particular trade partner and the home country may have an impact on trade flows and the desirability of forming a PTA involving the host country and this trade partner. Then, given that trade in goods and in services are correlated[12], there are reasons to believe that FDI flows may also be affected by the interdependence between different PTAs. Thus, it is important to also control for the presence of a PTA involving a host country's preferential trade partner and the home country to ascertain its impact on the effectiveness of enlarging market potential through the establishment of PTAs. This objective is achieved by splitting the term "weight of host" into two components which control for the presence of PTAs involving a preferential partner and the home country:

$$\text{weight of host} = \sum_{j \neq us,i} \left(I_{ijt}^{\text{no US}} * PTA_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right) + \sum_{j \neq us,i} \left(\left(1 - I_{ijt}^{\text{no US}}\right) * PTA_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right), \quad (1.3)$$

where the binary variable $I_{ijt}^{\text{no US}}$ equals one if country j has no PTA in place with the U.S. at year t, and zero otherwise. In the Robustness Section, we add a specification using eight home countries and, therefore, label this binary variable accordingly, $I_{ijt}^{\text{no home}}$.

An additional contribution of this paper is to investigate the effects of the different types of PTAs on FDI. We study the heterogeneous effects of FTAs and CUs on FDI flows. This

[12] Ariu et al. (2019) show empirically that Belgian firms tend to import goods and services from the same originating country and that barriers on imports of goods also tend to affect imports of services negatively.

distinction is important since Ornelas (2007) and Facchini, Silva, and Willmann (2013) show that the coordination of external tariffs characteristic of CUs leads to common external tariffs that are higher than external tariffs under an FTA. This result may provide greater incentives for inflows of FDI into members of a CU than into members of an FTA. Following Baier, Bergstrand, and Feng (2014), we adopt the assumption that common markets and economic unions are considered part of the group of CUs since these agreements tend to be deeper than agreements involving the formation of FTAs. Thus, the market potential variable is measured using information for FTA and CU members separately, allowing estimation of the following expression:

$$FDI_{it} = \beta_0 + \beta_1 X_{it} + M_{it_{FTA,CUs}} + \psi_i + \mu_t + \epsilon_{it}, \tag{1.4}$$

where

$$\begin{aligned} M_{it_{FTA,CUs}} &\equiv \text{Market Potential of country i at year t with different types of PTAs with country } j \\ &= \underbrace{\omega_0 Y_{it}}_{\text{host country } i \text{ market size}} + \underbrace{\omega_1 \left(\text{PTA}_{us,it} * \frac{Y_{us,t}}{\tau_{us,i}} \right)}_{\text{weight of U.S.}} + \underbrace{\omega_2 \sum_{j \neq i,h} \left(\text{FTA}_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of host (FTA)}} \\ &+ \underbrace{\omega_3 \sum_{j \neq i,h} \left(\text{CUs}_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of host (CUs)}} + \underbrace{\omega_4 \sum_{j \neq i} \left((1 - \text{PTA}_{ijt}) * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of ROW}} \end{aligned} \tag{1.5}$$

The trade literature also considers the effects of the reduction of trade costs on the margins of trade (intensive and extensive margins). This relationship is important because an increase in the extensive margin means more options for producers and consumers may become available as trade costs are reduced. In the case of trade in goods, Hummles and Klenow (2005) empirically investigate whether a larger economy exports larger quantities of each good (the intensive margin) or a wider set of goods (the extensive margin). They find in their cross-section analysis that the extensive margin of trade accounts for about 60 percent of the greater exports of large economies. Kehoe and Ruhl (2013) find that a

10 percent increase in trade between the two countries was associated with a 36 percent increase in the extensive margin of trade using the data for 1,900 bilateral country pairs over the period 1995-2005. Bernard et al. (2007) also find that variation in U.S. imports and exports is primarily due to extensive margins across five- or ten-year time horizons, while the intensive margin dominates variation in U.S. imports and exports across one-year (short-term) intervals. Baier, Bergstrand, and Feng (2014) consider the different effects of PTA formation on the intensive and extensive margins of trade, following Hummels and Klenow's (2005) decomposition method.

In the case of FDI, Anderson et al. (2019) develop a structural gravity model that considers joint interactions between international trade, domestic investment in physical capital accumulation, and FDI. Their model distinguishes between new direct investments that are previously not invested by multinationals (extensive margin of FDI) and the increase in the existing direct investments by multinationals (intensive margin of FDI). Based on the structural gravity model for FDI developed by Anderson et al. (2019), Nguyen (2019) empirically examines the determinants of bilateral FDI on intensive and extensive margins. She finds that conventional gravity variables such as the home/host GDPs, common currency, and PTA have significant and positive effects on both FDI margins. Unfortunately, there is not enough publicly available data to apply Hummels and Klenow's (2005) decomposition method in the case of FDI flows.[13] Therefore, this paper considers the effects of PTA formation on the different margins of FDI, using the following methodology to decompose aggregate FDI flows into its intensive and extensive margins.

(Decomposition Method)

$$IM_{it} = FDI_{it} \times \left(\frac{\text{the number of industry with nonzero FDI in t-1 and t}}{\text{total number of industry}} \right) \tag{1.6}$$

[13] The application of Hummels and Klenow's (2005) decomposition method requires industry-level information about the U.S. multinational affiliate sales to FDI recipient countries, as well as the rest of the world's multinational affiliate sales to FDI recipient countries. Unfortunately, there is no publicly available data for the rest of the world's multinational affiliate sales to the 48 FDI recipient countries used in our sample.

$$EM_{it} = FDI_{it} \times \left(\frac{\text{the number of industry with zero FDI in t-1 and nonzero FDI in t}}{\text{total number of industry}} \right), \tag{1.7}$$

where IM_{it} and EX_{it} stand for the intensive margin and the extensive margin of FDI in host country i at year t, respectively. Expression (1.6) indicates that we define the intensive margin of FDI as total affiliate sales in country i multiplied by the fraction of industries with nonzero affiliate sales in year $t-1$ and nonzero affiliate sales in year t. Similarly, we define the extensive margin of FDI as total affiliate sales in country i multiplied by the fraction of industries with zero affiliate sales in year $t-1$ and nonzero affiliate sales in year t. This methodology allows us to decompose total U.S. multinational foreign affiliate sales into the intensive and extensive margin of FDI. Applying this decomposition method in specification (1.1) allows us to estimate the effects of PTA formation on the different margins of FDI as follows.

$$IM_{it} = \theta_0 + \theta_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it} \tag{1.8}$$

$$EM_{it} = \lambda_0 + \lambda_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it} \tag{1.9}$$

Notice that we also combine our definition of the term "weight of host" in expression (1.3) to investigate the heterogeneous effects of interdependence across PTAs and their effects on the margins of trade.

We perform various robustness checks. First, we use information on FDI stocks, rather than information on FDI derived from the U.S. multinational foreign affiliate, as an important robustness check that allows having multiple home countries (as explained in the data section). The downside of this robustness test is a small reduction in the number of years covered by the data. This robustness test allows the estimation of the following specification where subscript h identifies the home country.

$$FDI_{hit} = \beta_0 + \beta_1 X_{hit} + M_{hit} + \eta_{hi} + \mu_t + \epsilon_{hit} \tag{1.10}$$

$$
\begin{aligned}
M_{hit} \equiv & \text{ Market Potential of country } i \text{ at year t for country } h \\
= & \underbrace{\omega_0 Y_{it}}_{\text{host country } i \text{ market size}} + \underbrace{\omega_1 \left(PTA_{hit} * \frac{Y_{ht}}{\tau_{hi}} \right)}_{\text{weight of home}} + \underbrace{\omega_2 \sum_{j \neq us,i} \left(PTA_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of host}} \\
& + \underbrace{\omega_3 \sum_{j \neq i} \left((1 - PTA_{ijt}) * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of ROW}},
\end{aligned}
$$

where η_{hi} controls for the home-host fixed effects. One component of M_{hit} that captures the market size of the home country is now called the "weight of home" instead of the "weight of U.S.". The rest of the notation used in the specification (1.10) is similar to the notation used in our main specification (1.1) with the addition of the home country identification for variables that vary in this dimension. Robust standard errors clustered at home-host country level are reported for all regressions involving FDI stocks.

Second, the robustness of our results is tested by modifying the econometric strategy used to obtain our main results. Baier, Bergstrand, and Feng (2014) suggest that first differencing the panel data yields some advantages over using fixed-effects models. For example, Wooldridge (2010, Ch. 10) suggests that the fixed-effect estimator is more efficient when the error terms are serially uncorrelated. However, it is very likely the case that the error terms are serially correlated over time, which means then that the fixed-effect model is less efficient. Therefore, we test our results by differencing the data to increase estimation efficiency. In addition, Wooldridge (2000, p.447) also notes that if the FDI and GDP variables follow a unit-root process and the number of periods is large, then the spurious regression problem can arise in a panel using a fixed-effects strategy. For these reasons, we follow Baier, Bergstrand, and Feng (2014), we estimate the main specifications (1.1) and (1.10) by taking the difference of the data over 5-year periods:

$$
\Delta_5 FDI_{us,it} = \beta_0 + \beta_1 \Delta_5 X_{it} + \Delta_5 M_{it} + \mu_t + \epsilon_{5,it} \tag{1.11}
$$

$$\Delta_5 FDI_{hit} = \beta_0 + \beta_1 \Delta_5 X_{hit} + \Delta_5 M_{hit} + \mu_t + \epsilon_{5,hit}, \tag{1.12}$$

where Δ_5 refers to first differencing over 5 years.

Last, we consider an instrumental-variable strategy to control for the endogeneity of the PTA formation variable and also test our results to an enlarged set of PTAs where we include partial-scope agreements as part of this group.

1.3 Data

We first measure FDI using the U.S. multinational foreign affiliate sales in 9 industries and 57 countries, provided by the Bureau of Economic Analysis (BEA), and aggregated using the International Survey Industry (ISI) classification from years 1983 to 2012.[14] The sample used in the econometric exercises relies on a subsample of 48 countries that allows consideration of the U.S. multinational affiliate sales from 1983 to 2012.[15] Alternatively, information on multinational activities based on FDI stocks is used to check the robustness of results. Beugelsdijk et al. (2010) argue that measuring FDI activities using affiliate sales rather than FDI stocks may be preferable, since the latter measure of FDI may bias multinational activities in recipient countries.[16]

Figure 1.1 shows the U.S. multinational foreign affiliate aggregate sales in the world over the years. This figure indicates that the activity of the U.S. multinational firms has increased

[14] Notice that a SIC-based ISI industry classification is used before 1999 and a NAICS-based ISI industrial classification is introduced in 1999 and is used thereafter. The industry-level aggregation is defined differently in each classification to add some newly defined sectors. This paper follows the SIC-based industry classification, which implies converting the newer NAICS-based classification into the SIC-based classification since the latter is more aggregated. As a result, there are nine industries in the dataset, including Chemicals, Electrical equipment, Finance and Insurance, Food, Machinery, Primary and fabricated metals, Services, Transportation equipment, and Wholesale trade industries.

[15] The 48 countries (out of 57 countries) in the dataset are selected based on data availability. The U.S. sales data for the selected 48 countries are available during the whole period from 1983 to 2012, while there is a significant discontinuity in the data for the remaining 9 countries.

[16] Beugelsdijk et al. (2010) argue that the FDI stock is a biased measure of FDI. First, the FDI stock also captures FDI in tax havens. However, this type of FDI does not reflect any productive activity and, therefore, it overestimates multinational activities. Second, the FDI stock does not account for locally raised funds by multinational foreign affiliates. This implies that FDI stocks tend to underestimate multinational activities. Third, multinational activities are also dependent on local labor productivity and FDI stocks do not reflect this information. Therefore, FDI stocks tend to underestimate multinational activities in countries with high labor productivity.

more than sixfold since the mid-1980s, reaching US$5.9 trillion in 2012. Notably, the U.S. multinational foreign affiliate sales have rapidly increased since the formation of the WTO in 1995, and their growth rate has accelerated since the year 2000. This information is in line with the argument that trade agreements (multilateral and preferential) decrease uncertainty in trade policies, which facilitates the realization of FDIs. For instance, Pierce and Schott (2016) show that the accession of China to the WTO has led many U.S. firms to invest in China as part of their global production strategies, given the decrease in the uncertainty of the U.S. trade policy toward China. They show that this is one of the channels through which China's WTO accession process has led to an increase in the U.S. imports from China, which have negatively affected the U.S. manufacturing employment levels.

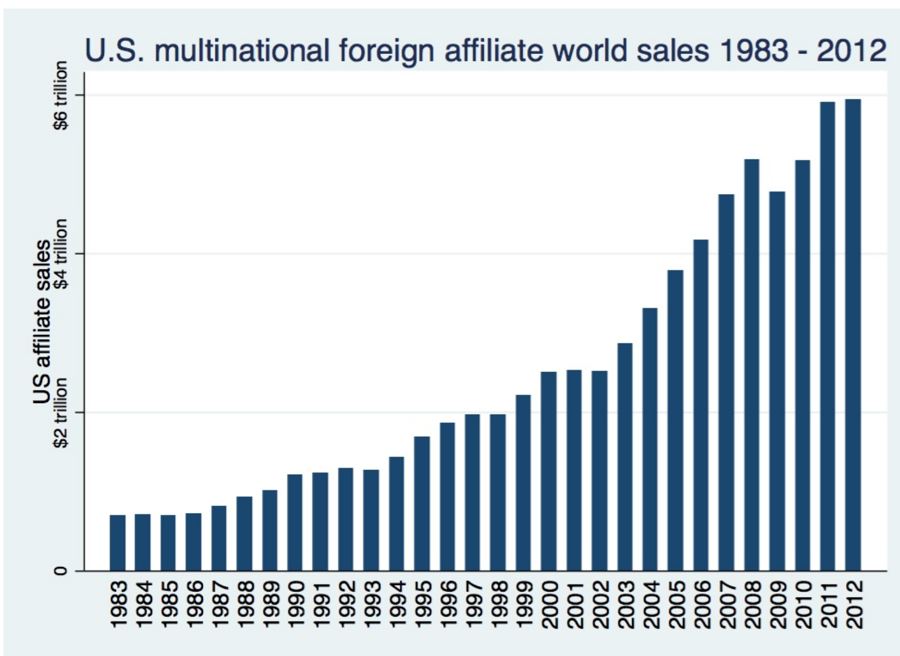


Figure 1.1: U.S. multinational foreign affiliate sales from 1983 - 2012

The worldwide increase in FDI levels that took place in the last four decades coincided with a surge in the formation of PTAs. This phenomenon has intensified since the 1990s, as Figure 1.2 shows.[17] The number of PTAs in force in 1995 was just 44, but the number quintupled to 233 active agreements in 2012, and reached 337 active agreements in 2021.

[17]Source: WTO regional trade agreements database: https://www.wto.org/english/tratop_e/region_e/region_e.htm

More importantly, most PTAs take the form of FTAs rather than CUs. According to the WTO, the number of FTAs was eight times the number of CUs, but this difference narrows if we consider the number of country pairs involved in each type of agreement.[18] FTAs tend to be formed by countries with the same development status (e.g., Chile-Columbia-Mexico FTA) and by those with different development status (e.g., Chile-U.S. FTA), while CUs tend to involve primarily countries with the same development status (e.g., European Union and Mercosur).[19]

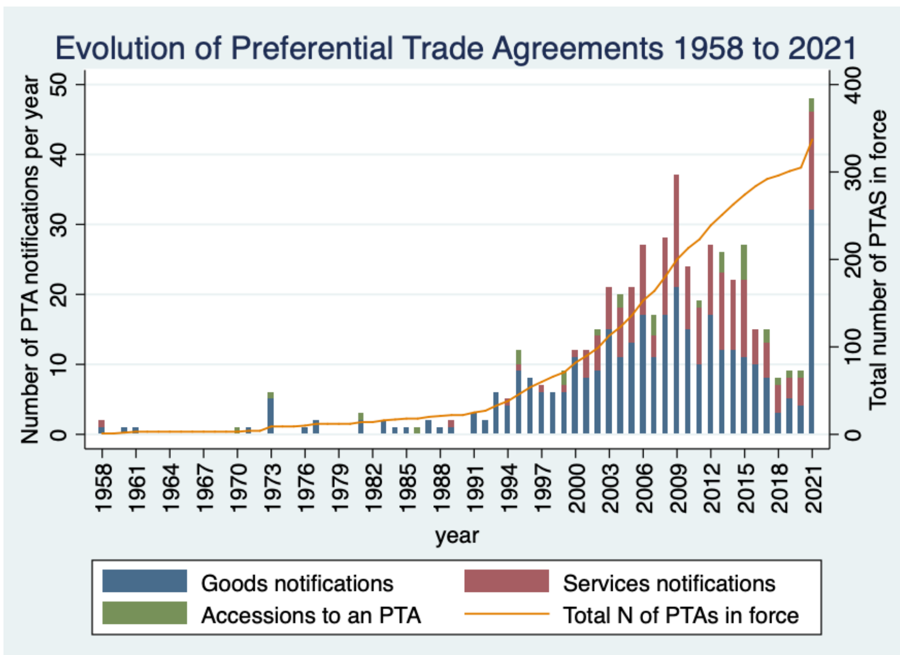


Figure 1.2: Cumulative number of physical PTAs in force

A glance at the evolution of the U.S. multinational foreign affiliate sales and the number of active PTAs suggests that there is a positive correlation between the two variables, shown in Figure 1.3. However, this correlation does not directly explain the causal relationship between them; therefore, we apply rigorous econometric analysis to study the effects of the formation of PTAs on multinationals' activities in the form of FDI.

The world economic-integration process has led to the formation of many multilateral

[18]This fact mainly represents the situation of the European Union, which represents a CU, and it has 28 members as of 2018. This number ignores the departure of the United Kingdom from the EU in January of 2020.

[19]The only active North-South CU is the EU-Turkey PTA.

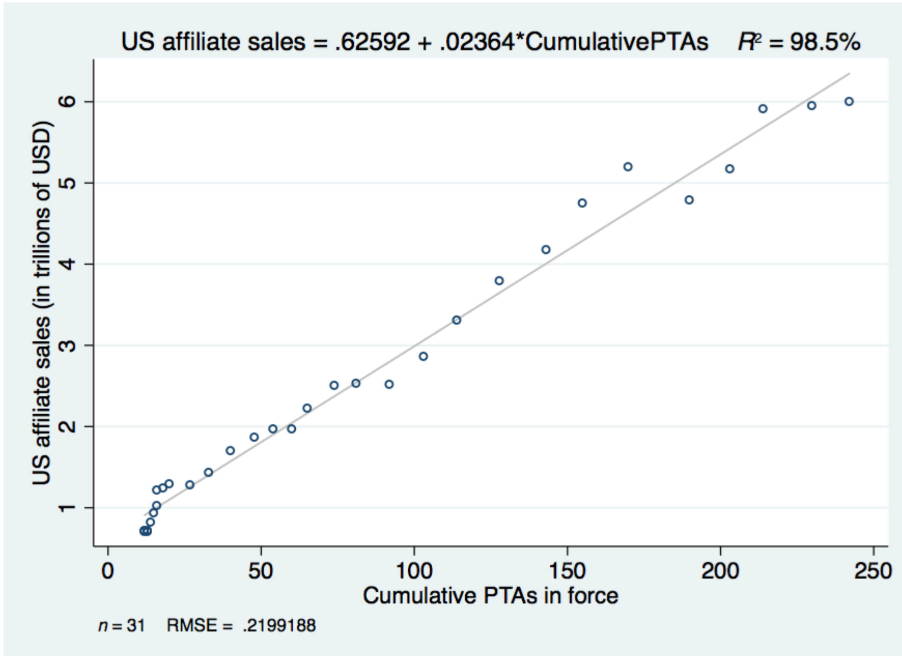


Figure 1.3: Correlation between the U.S. foreign affiliate sales and the number of PTAs in force

PTAs where more than two countries are members of the same preferential arrangement. For instance, the current form of the European Union is a result of the original Treaty of Rome, dated 1957, and eight additional assessment processes that have led to the increase of membership in that agreement from the 6 original members to the current 28 members. Consequently, the investigation of the effects of the formation of PTAs on FDI flows requires considering not only whether the host country has a PTA with the home country, but also the importance of all additional markets to which the host economy can export on a preferential base. This is the case because establishing a presence in the host country implies that a multinational firm can then trade (export and import) on a preferential basis with its preferential partners. Our paper constructs the market potential variable as defined in expression (1.2). This variable controls for the U.S. market size, host country i's market size, its preferential partners' market size, and the rest-of-the-world market size. We are particularly interested in examining the contribution of host country i's PTAs with other countries excluding the home country that directly conducts FDI in the host country–i.e., "weight of host" in expression (1.2).

Figure 1.4 displays the values of weight of host in 1995 (Panel A) and in 2012 (Panel B). Europe and Southeast Asia represent the regions of the globe which have earned higher values in the weight of host over time, due to the presence of PTAs with countries other than the U.S.[20] According to Figure 1.4, European countries face on average the highest values in the weight of host in 2012, because European countries formed PTAs with other European countries whose GDPs are relatively larger, compared with the rest of the world. On the other hand, Table 1.1 provides the percentage change in the U.S. affiliate sales and percentage change in weight of host in European countries from 1995 to 2012. On average, the U.S. multinational foreign affiliate sales have increased by 285% while the weight of host has increased by 40%. This suggests that there is a positive relationship between change in weight of host and change in the U.S. affiliate sales. Table 1.1 also shows that Ireland, Luxembourg, and Switzerland have faced below-average increases in weight of host during the periods from 1995 to 2012, but they have experienced above-average increases in the U.S. affiliate sales during the same periods. These data suggest that the weight of host in the market potential in expression (1.2) may play an important role in explaining FDI inflows, but other country characteristics may also be important in determining FDI inflows.

We collect the data on the corporate tax from KPMG Corporate Tax Rates Survey. Whenever corporate tax information for a country is unavailable, we then use the latest available corporate tax rate for that country. Market size is measured using information on real GDP data from the World Bank's development indicators, while we use real GDP per capita as a proxy for the country-level capital/labor ratios from the same source.[21] Furthermore, the trade cost between two countries is measured using the bilateral weighted distance data constructed by Head and Mayer (2003).

An essential step in the empirical strategy is to identify when two countries belong to a PTA. This process also enables us to distinguish the PTA type (FTAs or CUs) and to identify hub-and-spoke PTAs. We interpret these type of preferential agreements as a situation in

[20] The dataset includes 17 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the U.K., and 5 Southeast Asian countries: Indonesia, Malaysia, Philippines, Singapore, Thailand.

[21] GDP and GDP per capita data for Taiwan are collected from the Republic of China's National Statistics website.

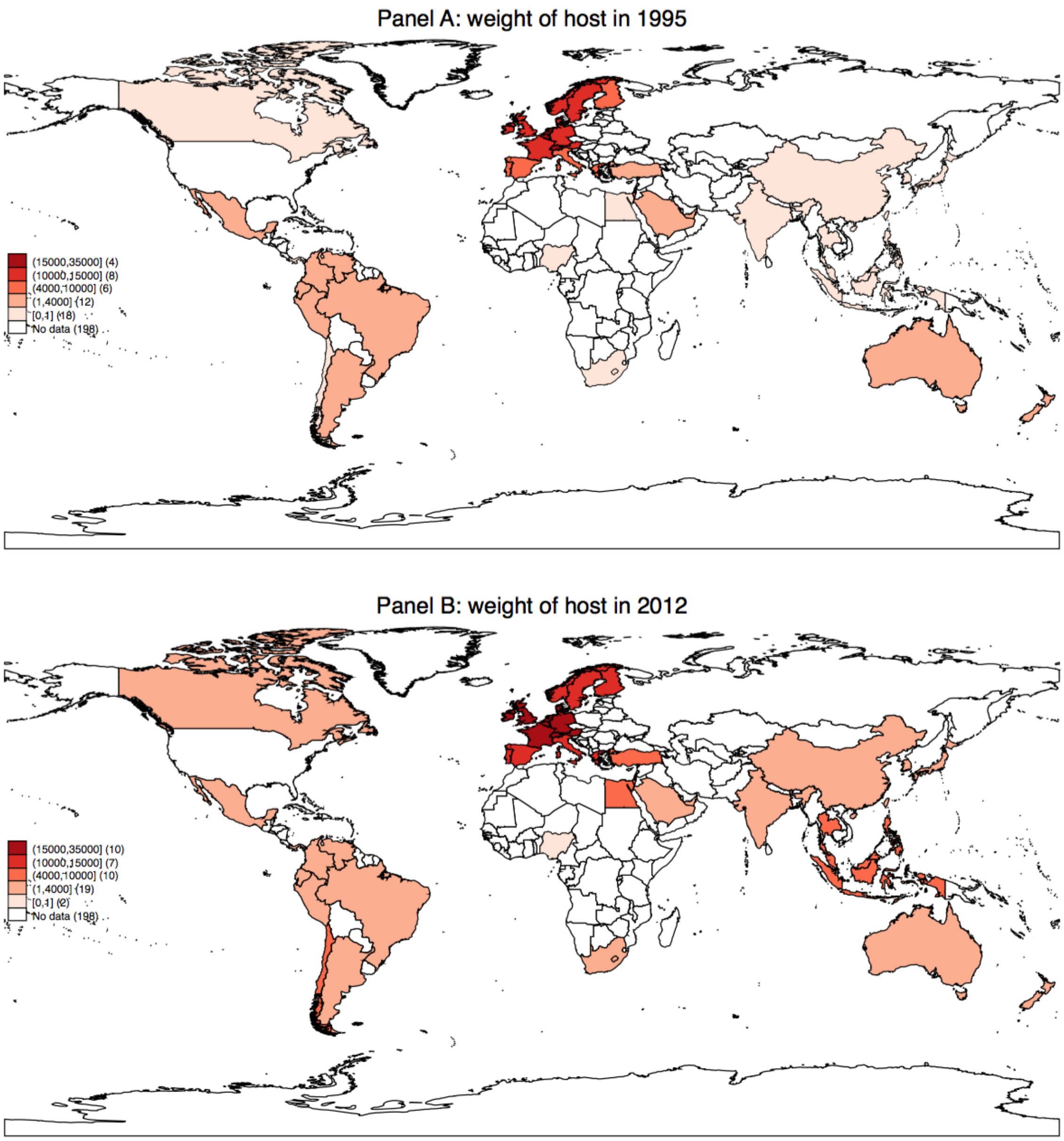


Figure 1.4: The values of weight of host in 1995 and 2012 (in million of US dollars / kilometer)

Table 1.1: Percentage change in the U.S. affiliate sales and weight of host (from 1995 to 2012)

Country	%Δ U.S. affiliate sales	%Δ weight of host
Austria	67%	34%
Belgium	188%	37%
Denmark	166%	38%
Finland	166%	40%
France	82%	38%
Germany	72%	42%
Greece	81%	53%
Ireland	1141%	39%
Italy	82%	44%
Luxembourg	1396%	35%
Netherlands	140%	36%
Norway	434%	44%
Portugal	56%	42%
Spain	97%	39%
Sweden	113%	38%
Switzerland	399%	39%
U.K.	162%	39%
Average	285%	40%

which a country is a member of a PTA, and its partner may also have a PTA in place with the U.S. As suggested above, the interdependence between PTAs may affect the effectiveness of market potential in promoting FDI inflows. Consider the example of Japan and Chile. These two countries formed an FTA in 2007, but Chile and the U.S. have also had an FTA in place since 2004. In this case, the Chile-Japan FTA may not have promoted FDI inflows in Japan since the Chileans also had a bilateral agreement with the U.S., possibly diluting the effect of preferential access granted to Japan.

We use the information on PTAs organized by Scott Baier and Jeffrey Bergstrand.[22] Our main results consider that a PTA is present if either an FTA or a CU is active. As a robustness test, we enlarge the set of PTAs to include partial-scope agreements. Following common assumptions used in the literature, common markets (CMs) and economic unions (ECUs) are considered part of the CU group. Two variables are constructed to assist in measuring the market potential variable described by expression (1.2): The binary variable 'PTA' equals to one if two countries are members of the same preferential agreement, and is zero otherwise; while, for the country-pairs that are part of a PTA, a binary variable labeled 'FTA' equals one if two countries are part of the same FTA, and zero if they are part of a CU.

Tables 1.2 and 1.3 present the summary statistics of the main panel dataset. In this case, we use FDI information based on U.S. multinational foreign affiliate sales and FDI stocks, respectively. The dataset based on the U.S. multinational foreign affiliate sales contains 1,440 observations (48 host countries over 30 years from 1983 to 2012). The information on intensive and extensive margins, in this case, is limited to 1,392 observations since one year of data is lost in calculating the FDI margins. The dataset on FDI stocks contains 10,752 observations, consisting of eight FDI home countries (Finland, France, Germany, Italy, Japan, Portugal, the United Kingdom, and the United States), 48 recipient countries, and 28 years of data from 1985 to 2012. The standard deviation of the different components of market potential is used in determining the effects of PTA formation on FDI flows.

[22]Their dataset can be downloaded from Kellogg Institute for International Studies' website at kellogg.nd.edu/nsf-kellogg-institute-data-base-economic-integration-agreements.

Table 1.2: Summary statistics for the U.S. affiliate sales dataset

Panel A						
Variable	**Units**	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
U.S. affiliate sales	(in millions of USD)	49645.843	89894.075	0	664152	1440
weighted distance	(in kilometers)	9017.198	3479.971	2079.297	15535.873	1440
host country i GDP per capita	(in US dollar)	25238.206	22167.466	423.593	110001.052	1440
U.S. GDP	(in millions of USD)	11478797.35	2755394.059	6874947.5	15542162	1440
host GDP	(in millions of USD)	652975.994	989698.200	3252.694	7207389.5	1440
weight of U.S.	(in millions of USD/km)	222.449	1013.294	0	7474.721	1440
weight of host	(in millions of USD/km)	5662.496	7751.022	0	33043.15	1440
j has no PTA with US	(in millions of USD/km)	5589.413	7708.714	0	32688.09	1440
j has PTA with US	(in millions of USD/km)	73.082	117.846	0	991.43	1440
weight of ROW	(in millions of USD/km)	3413.363	1965.625	427.974	14899.656	1440
N of PTA with others	-	8.917	8.934	0	34	1440
corporate tax	(percentage)	31.905	9.19	0	56.66	1440
PTA with U.S. (dummy)	(1 if host PTA with U.S.)	0.07	0.255	0	1	1440
PTA with others (dummy)	(1 if host has PTA with others)	0.694	0.461	0	1	1440
year	-	-	-	1983	2012	1440

Panel B (weight of host by designation)						
Variable	**Units**	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
weight of host (FTA)	(in millions of USD/km)	1419.052	3370.651	0	26439.311	1440
j has no PTA with US	(in millions of USD/km)	1345.969	3351.22	0	25927.18	1440
j has PTA with US	(in millions of USD/km)	73.08	117.846	0	991.43	1440
weight of host (CUs)	(in millions of USD/km)	4243.444	7152.261	0	30730.197	1440
j has no PTA with US	(in millions of USD/km)	4243.444	7152.261	0	30730.197	1440
j has PTA with US	(in millions of USD/km)	0	0	0	0	1440
weight of host (Partial)	(in millions of USD/km)	331.974	804.027	0	6169.839	1440

Panel C (Intensive and Extensive margins of the U.S. affiliate sales)						
Variable	**Units**	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
U.S. affiliate sales	(in millions of USD)	50879.05	91072.027	0	664152	1392
intensive margin of U.S. sales	(in millions of USD)	50154.589	90886.424	0	664152	1392
extensive margin of U.S. sales	(in millions of USD)	724.461	2680.55	0	33199.332	1392

Table 1.3: Summary statistics for FDI stock dataset with 8 home countries (Finland, France, Germany, Italy, Japan, Portugal, U.K. and U.S.)

Variable	**Units**	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
FDI stock	(in millions of USD)	9609.972	34338.573	-30237.052	645098	10752
weighted distance	(kilometers)	7014.651	4475.307	377.74	19539.478	10752
country i GDP per capita	(in millions of USD)	25821.584	22421.182	451.654	110001.052	10752
home GDP	(in millions of USD)	3300468.711	3656551.568	126443.273	15542162	10752
host GDP	(in millions of USD)	847906.655	1810377.169	3252.694	15542162	10752
weight of home	(in millions of USD/km)	790.607	2582.841	0	36059.148	10752
weight of host	(in millions of USD/km)	3429.386	5653.493	0	33043.15	10752
j has no PTA with Home	(in millions of USD/km)	2587.97	5285.105	0	32688.092	10752
j has PTA with Home	(in millions of USD/km)	841.416	2081.3979	0	29024.871	10752
weight of ROW	(in millions of USD/km)	4493.827	2098.583	427.974	16300.585	10752
N of PTAs with others	-	8.710	8.622	0	34	10752
corporate tax	(percentage)	31.8	9.113	0	56.66	10752
PTA with home(dummy)	(1 if host PTA with home)	0.333	0.471	0	1	10752
PTA with others (dummy)	(1 if host PTA with others)	0.717	0.451	0	1	10752
year	-	-	-	1985	2012	10752

1.4 Main Empirical results

Table 1.4 shows baseline regression results from estimating expression (1.1) while controlling for year and host country i fixed effects.[23] The specification used in column (1) defines the contribution of the formation of PTAs to the market potential of a host country by the presence of a PTA between the U.S. economy and the host economy (PTA with the U.S.), and by the presence of a PTA between the host country and other countries (PTA with others). The specification used in column (2) controls for the contribution of PTA formation to market potential by including a variable measuring the number of the host country's other preferential partners (number of other countries). The results in column (1) suggest that the presence of a PTA between the U.S. and the host economy has a positive and statistically significant effect on FDI activities. In particular, the results imply that the presence of a PTA with the U.S. increases the U.S. multinational sales by about US$57 billion.[24] The results in column (1) also suggest that the presence of a PTA with other economic partners is not statistically significant. Likewise, the results shown in column (2) suggest that the number of host country's PTA partners has a positive, albeit statistically insignificant effect on the U.S. multinational sales.

The specifications used in columns (3) and (4) control for the main measure of host country i's market potential based on expressions (1.2) and (1.3), respectively. In these cases, the market potential is based on the presence of PTAs, the size of the preferential markets, and on the geographical costs of trading with preferential partners. Moreover, the

[23]La Porta et al. (1998) find that countries whose legal rules originate in common law (British origin) tradition tend to have higher investor protections than the countries whose legal rules originate in civil law tradition. Furthermore, La Porta et al. (1997) find that countries with higher investor protections tend to have the most developed capital markets because a good legal environment protects the potential financiers against expropriation by entrepreneurs and has a significant effect on the ability of firms to raise external finance in the capital markets. These previous findings suggest that the legal origin and the associated level of investor protections may potentially affect the country's ability to attract FDI from the U.S. multinational firms. However, as La Porta et al. (1998) argue, the legal origin is obtained by each country mostly through colonization or conquest in the past. Thus, there is almost no variation in our sample (48 host countries) in terms of legal origin during the period from 1983 to 2012. More importantly, the legal origin is less likely to affect our main findings because the host country fixed effects in our regressions already capture the possible effects of each country's legal origin on FDI.

[24]This study uses total U.S. multinational foreign affiliate sales in a country i instead of industry-level U.S. multinational sales.

measure of market potential applied to the specification used in column (4) also controls for PTAs between the partner country j and the U.S. The results shown in column (3) are consistent with our priors, since the different elements defining market potential according to expression (1.2) have their expected signs. The estimated coefficients of the host country's GDP, of the contribution of a PTA between the host and the U.S. (weight of U.S.), and of the market access generated by the formation of PTAs between the host and other countries (weight of host) are all positive and statistically significant. The specification used in column (3) then represents our preferred specification.

The estimated coefficient of 0.049 on country i's GDP implies that an increase of US$1 million in country i's GDP is associated with an increase of US$49,000 in the U.S. multinational firms' FDI (sales) into the host country i. The estimated coefficient of 28.666 on weight of U.S. implies that a one-standard-deviation increase in host country i's market potential related to the formation of a PTA with the U.S. is associated with an increase of about US$29.0 billion (28.666 multiplied by 1013.294) in the U.S. multinational FDI. Similarly, the estimated coefficient of 6.589 on weight of host implies that a one-standard-deviation increase in market potential related to the formation of PTAs between the host economy and other countries is associated with an increase of about US$51.1 billion (6.589 multiplied by 7751.022) in the U.S. multinational FDI inflows. These results confirm the assumption that, the larger the preferential markets to which a host country i has access, the larger the FDI inflows the country receives. Notice that these results are based on data that include the formation of PTAs from 2000 to 2012, a time period where we have witnessed the highest growth in the number of PTAs formed.

The estimated coefficient of weight of ROW in column (3) is also positive and significant. However, it is unclear whether the direction of this result makes economic sense, since the formation of PTAs not involving the host country could enlarge the market potential of other countries, thereby leading the U.S. multinational firms to shift their FDI activities from host country i to the ROW. One possible explanation for the positive coefficient on weight of ROW could be related to tariffs reductions resulting from the formation of FTAs among countries in the ROW. As we discussed above, the vast majority of current PTAs take the form of FTAs. This fact suggests that external tariffs set by countries in the ROW could be lowered by the formation of these FTAs. Therefore, the host country may increase its market access to economies in the ROW, which could allow the U.S. multinational firms to use the host country i as an export platform to sell goods to the ROW.

The specification used in column (4) is similar to the specification used in column (3) except that it splits the effects of the term weight of host into two components following expression (1.3). In this case, we can assess whether the effects of an increase in market potential through PTA formation on FDI inflows is driven by PTAs with trade partners that do not have an agreement with the U.S. It is conceivable that forming PTAs with countries that also exchange preferential access with the U.S. may even decrease FDI inflows into the host country since these agreements could represent additional competition to attract FDI inflows with similar characteristics. The results shown in column (4) confirm that PTA formation tends to increase FDI inflows only if the preferential partners do not have a preferential agreement with the U.S. This result highlights the necessity to consider the interdependence between PTAs in the context of FDI. Notice also that all other control variables describing the characteristics of the host country are consistent with expectations. The results suggest that host countries with a higher capital/labor ratio tend to attract more affiliate sales. In contrast, host countries with higher corporate tax discourage the U.S. multinational firms' FDI activities.

Table 1.4: The effect of market potential of host country i in attracting the U.S. multinational FDI[a]

VARIABLES	(1) U.S. affiliate sales	(2) U.S. affiliate sales	(3) U.S. affiliate sales	(4) U.S. affiliate sales
host country i GDP per capita	1.861***	2.055***	1.320***	1.325***
	(0.263)	(0.281)	(0.293)	(0.294)
corporate tax	-1,475.357***	-1,305.442***	-967.329***	-943.886***
	(369.060)	(355.583)	(361.271)	(360.359)
host country i GDP	0.050***	0.049***	0.049***	0.049***
	(0.006)	(0.006)	(0.006)	(0.006)
PTA with U.S.	57,671.678***			
	(10,309.093)			
PTA with others	-5,331.709			
	(3,839.378)			
N of PTAs with others		306.193		
		(328.286)		
weight of U.S.			28.666***	28.582***
			(2.750)	(2.747)
weight of host			6.589***	
			(1.202)	
j has no PTA with US				6.631***
				(1.200)
j has PTA with US				0.110
				(14.051)
weight of ROW			6.682***	6.488***
			(1.624)	(1.654)
Year fixed effects	Yes	Yes	Yes	Yes
Host country i fixed effects	Yes	Yes	Yes	Yes
Observations	1,440	1,440	1,440	1,440
R-squared	0.825	0.816	0.844	0.844
Number of host country i	48	48	48	48

[a] Dependent variable: Total U.S. multinational foreign affiliate sales. Column (3) considers the market potential of host country i, detailed in expression (1.2). Column (4) separates weight of host into if host's partner has no PTA with US or if host's partner country has a PTA with US. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

The results in Table 1.4 confirm that the market potential of host country i plays a significant role in attracting the U.S. multinational firms' FDI. Next, the study turns to investigate whether the type of PTAs (FTAs or CUs) plays an important role in determining the U.S. multinational firms' activities. Table 1.5 reports estimates of expression (1.4) while considering the market potential related to the formation of FTAs and CUs separately, detailed in expression (1.5). Results are similar to those shown in Table 1.4, except for the variable controlling for the presence of PTAs with other countries in column (1), and for the variable measuring the number of CU partners in column (2). These variables have coefficients with unexpected negative signs. These results strongly suggest that simply considering only the presence of FTA or CUs, or simply counting the number of CU preferential partner countries, may not be sufficient to capture the full impact of the presence of PTAs on host country i's market potential.

Consequently, the focus turns to the main definition of market potential involving the formation of FTAs and CUs outlined in expression (1.5), as well as its definition controlling for the presence of a PTA between partner country j and the U.S., which is outlined by expression (1.3). The results shown in column (3) of Table 1.5 suggest that the host country i's GDP, the variables weight of U.S., weight of host (FTA) and weight of host (CUs), have the expected positive and statistically significant effects on FDI inflows. Importantly, while the coefficient for FTA is larger than the coefficient for CU, the economic effect of the formation of CUs involving the host country in its market potential is larger than the effects generated by the formation of FTAs. This finding is true because the estimated coefficient of 9.825 on the variable weight of host (FTA) implies that an increase of one standard deviation of this variable is associated with an increase of US$33.1 billion (9.825 multiplied by 3370.651) in the U.S. multinational firms' FDI inflows. In comparison, the estimated coefficient of 6.709 on the variable weight of host (CUs) implies that a one-standard-deviation increase of this variable yields an associated increase of US$48.0 billion (6.709 multiplied by 7152.261) in the U.S. multinational firms' FDI inflows.[25]

[25]Under the null hypothesis H_0 : standard deviation $\times$ the estimated coefficient weight of host (FTA) = standard deviation $\times$ the estimated coefficient weight of host (CUs), Wald test gives $F(1, 1356) = 9.55$. Therefore, we reject the null and accept that standard deviation $\times$ weight of host (FTA) $\neq$ standard deviation

The results shown in column (4) of Table 1.5 investigates the effects of market potential on FDI while controlling for the presence of a PTA between a preferential partner and the U.S. The results are very in line with the findings described in Table 1.4. In this case, we find that the formation of FTAs with countries other than the U.S. only promotes FDI inflows if the partner country does not have a PTA with the U.S. (see coefficients related to the weight of host).[26] Thus, the results in columns (3) and (4) confirm that a host country forming CUs tends to face larger volumes of multinational activities than one forming FTAs. Furthermore, the formation of an FTA between the host country and trade partners only promotes FDI inflows if the partner countries do not also have an FTA in place with the U.S.

In addition to the results discussed in Table 1.5, we show in column (2) of appendix (Table A1) that our results are also robust to splitting weight of host (CUs) into two parts: weight of host (EU) and weight of host (non EU). Looking at the preferential trade agreements data, the largest PTA in terms of the number of countries is the EU, which corresponds to a CU in our paper. To test the robustness of the results in Table 1.5, we distinguish between the EU and other CUs involving non-EU members. We, therefore, divide weight of host (CUs) into weight of host (EU) and weight of host (non EU). Disentangling the effects of weight of host, we continue to find that CUs have a stronger effect in promoting FDI into the host country than FTAs. However, this result is mainly driven by the preferential access exchanged among EU members. The other CUs also generate a positive effect in promoting FDI, but less important than the effects generated by FTAs.

× weight of host (CUs).

[26]Notice that the U.S. has not formed or joined any CU up to this point. This fact implies that only the part of the variable weight of host related to FTAs needs to control for this type of agreements between a trade partner and the U.S.

Table 1.5: Level regressions with different types of PTAs

VARIABLES	(1) U.S. affiliate sales	(2) U.S. affiliate sales	(3) U.S. affiliate sales	(4) U.S. affiliate sales
host country i GDP per capita	1.779***	2.320***	1.502***	1.510***
	(0.268)	(0.311)	(0.311)	(0.312)
corporate tax	-1,505.879***	-1,397.652***	-884.753**	-853.430**
	(364.545)	(359.066)	(367.455)	(365.862)
host country i GDP	0.048***	0.048***	0.049***	0.049***
	(0.006)	(0.006)	(0.006)	(0.006)
PTA with U.S.	52,076.585***			
	(10,261.889)			
PTA with others (FTA)	-299.204			
	(3,974.671)			
PTA with others (CUs)	-21,965.314***			
	(2,944.805)			
N of PTAs with others (FTA)		609.685*		
		(354.221)		
N of PTAs with others (CUs)		-1,334.947***		
		(383.964)		
weight of U.S.			28.061***	27.948***
			(2.819)	(2.815)
weight of host (FTA)			9.825***	
			(1.384)	
j has no PTA with US				9.891***
				(1.377)
j has PTA with US				1.255
				(14.071)
weight of host (CUs)			6.709***	6.765***
			(1.177)	(1.178)
weight of ROW			7.893***	7.639***
			(1.599)	(1.643)
Year fixed effects	Yes	Yes	Yes	Yes
Host country i fixed effects	Yes	Yes	Yes	Yes
Observations	1,440	1,440	1,440	1,440
R-squared	0.828	0.818	0.847	0.847
Number of host country i	48	48	48	48

[a] Dependent variable: Total U.S. multinational foreign affiliate sales. Column (3) considers the market potential of host country i related to the formation of FTAs and CUs separately, detailed in expression (1.4). Column (4) considers the market potential of FTAs and CUs separately and distinguishes weight of host by if the host's partner country has a direct PTA with US. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

Next, the effects of the market potential on the intensive and extensive margins of FDI are investigated. The specifications used in columns (1)-(6) of Table 1.6 report estimates of the effects of market potential on the intensive and extensive margins of the U.S. multinational FDI activities while controlling for year fixed effects and host country i's fixed effects. Furthermore, the specifications used in columns (7)-(8) additionally controls for the effects of the presence of PTAs between trade partners and the U.S. on FDI inflows. Notice that the dependent variable follows expressions (1.6) and (1.7) in order to decompose the U.S. multinationals' FDI into intensive and extensive margins. As a result, the number of observations is reduced to 1,392 because the observations for the year 1983 are used to calculate the intensive and extensive margins of FDI for the year 1984.

The results shown in Table 1.6 confirm the vast majority of our priors since the signs of the coefficients of our main variables are as expected. In particular, the results shown in column (5) suggest that the effects of market potential on the intensive margin are similar to the results described in Tables 1.4 and 1.5, and they are economically and statistically significant for the variables host country i GDP, weight of U.S., and weight of host. On the other hand, the effects of the different components of the market-potential measure on the extensive margin generally are statistically insignificant, as can be verified in column (6). Importantly, the effects of market potential on the intensive margin are always greater than those on the extensive margin. This result indicates that the existing U.S. multinational affiliate firms tend to expand their existing FDI activities in a foreign country (i.e., intensive margin of FDI) rather than conducting FDI activities in new industries in which they had not previously invested in a foreign country (i.e., extensive margin of FDI).

Notice that the results shown in column 7 of Table 1.6 once again confirm that interdependence among PTAs is important since the effects of the variable weight of host is only important at the intensive margin of FDI if the trade partner does not have a PTA with the U.S. Finally, one potential reason for the insignificant effects of market potential on the extensive margin is the limitation of the U.S. affiliate sales dataset, which only contains nine industries, corresponding to a fairly high level of aggregation. Unfortunately, there is currently no other publicly available dataset that contains more industrial sectors with information on the U.S. multinational foreign affiliates.

Table 1.6: Intensive and extensive margins of the U.S. affiliate sales

VARIABLES	(1) intensive margin	(2) extensive margin	(3) intensive margin	(4) extensive margin	(5) intensive margin	(6) extensive margin	(7) intensive margin	(8) extensive margin
host country i GDP per capita	1.918***	0.028*	2.123***	0.026	1.400***	0.019	1.407***	0.019
	(0.277)	(0.016)	(0.295)	(0.016)	(0.309)	(0.022)	(0.311)	(0.022)
corporate tax	-1,455.128***	10.588	-1,288.138***	21.132	-980.745***	24.613	-951.632***	21.814
	(365.989)	(19.180)	(352.273)	(19.418)	(362.030)	(19.970)	(361.254)	(20.541)
host i GDP	0.050***	-0.000	0.049***	-0.000	0.049***	-0.000	0.049***	-0.000
	(0.006)	(0.000)	(0.006)	(0.000)	(0.006)	(0.000)	(0.006)	(0.000)
PTA with U.S.	55,376.524***	1,103.860						
	(10,350.776)	(950.958)						
PTA with others	-5,488.118	447.877*						
	(3,883.206)	(229.191)						
N of PTAs with others			285.959	60.375*				
			(332.510)	(31.374)				
weight of U.S.					28.604***	0.127	28.499***	0.137
					(2.856)	(0.162)	(2.853)	(0.162)
weight of host					6.542***	0.041		
					(1.266)	(0.096)		
j has no PTA with US							6.595***	0.036
							(1.263)	(0.098)
j has PTA with US							-1.277	0.793
							(14.306)	(1.017)
weight of ROW					6.871***	-0.085	6.595***	0.036
					(1.702)	(0.126)	(1.263)	(0.098)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Host country i fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,392	1,392	1,392	1,392	1,392	1,392	1,392	1,392
R-squared	0.831	0.154	0.822	0.151	0.849	0.149	0.849	0.150
Number of host country i	48	48	48	48	48	48	48	48

[a] Dependent variable: Intensive and extensive margins of the U.S. foreign affiliate sales in odd and even numbers of columns, respectively. Columns (5) and (6) consider the market potential of host country i, detailed in expression (1.2). Columns (7) and (8) distinguish weight of host by if the host's partner country has a direct PTA with US. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

1.5 Robustness tests

The baseline empirical results in the previous section show that the larger the preferential markets to which a host country i has access, the larger the FDI inflows this country receives. Importantly, the results strongly indicate that the effectiveness of preferential markets in attracting FDI inflows depends on having preferential partner countries that do not have a PTA in place with the home country (U.S.). These results rely on information about the U.S. multinational foreign affiliate sales provided by the Bureau of Economic Analysis. Furthermore, they suggest that the amount of FDI inflows that a host country i receives depends on the type of PTAs it enters. The formation of CUs tends to promote FDI inflows more than the formation of FTAs does. This can be explained by the presence of the tariff complementarity effects in forming FTAs. Likewise, we find that the intensive margin effect always outweighs the extensive margin effect, indicating that the U.S. multinational firms increase their FDI activities through the expansion of existing affiliate sales in a host country i.

This section tests the robustness of baseline results in the following five ways. First, we assess whether the type of PTA matters in determining the effects of market potential on the intensive margin and the extensive margin of FDI. Second, we consider an alternative definition of FDI that measures the stock of foreign capital owned by multinational firms from eight different home countries: Finland, France, Germany, Italy, Japan, Portugal, the U.K., and the U.S. The capital stock data for these eight home countries' multinationals are obtained from OECD's FDI stock database. Third, we consider an alternative econometric approach based on the first differencing of the data over five years, while also controlling for initial values of each country i's characteristics, to account for the full impact of market potential on FDI. Fourth, the paper employs an instrumental variable method to correct for the potential endogeneity bias of PTA formation. Last, we consider additional robustness tests such as enlarging our definition of market potential by also accounting for the formation of partial-scope agreements, dividing weight of host (CUs) into weight of host (EU) and weight of host (non EU), dropping observations with zero FDI inflows, and using 2-year and

3-year lags of the explanatory variables to test the robustness of our results related to the external margin of trade.

Table 1.7 shows the results of the estimation of specifications (1.8) and (1.9) while controlling for the host country's market potential in the presence of FTAs and CUs separately. The overall results generally align with the results shown in Table 1.6. The effects of market potential on the intensive margin are always larger than the effects on the extensive margin, although most results related to the extensive margin are not statistically significant. Considering the comprehensive definition of market potential based on expressions (1.3) and (1.5), while controlling for the host country's market potential in the presence of FTAs and CUs separately, the results in column (5) show that a one-standard-deviation increase in the variable weight of host (CUs) is associated with an increase of US$48.1 billion in FDI inflows through the intensive margin of FDI, while a one-standard-deviation increase in the variable weight of host (FTA) is associated with an increase of US$33.0 billion through the intensive margin of FDI.[27] Therefore, the formation of CUs promotes the effects of market potential through the intensive margin of FDI by about US$15.1 billion more than the formation of FTA does. Importantly, the results in column (7) confirm that the effectiveness of FTA formation in attracting FDI flows only takes place if the partner countries do not have an FTA in place with the U.S.

[27] Under the null hypothesis H_0 : standard deviation $\times$ the estimated coefficient weight of host (FTA) = standard deviation $\times$ the estimated coefficient weight of host (CUs), Wald test gives $F(1, 1309) = 8.92$. Therefore, we reject the null and accept that standard deviation $\times$ weight of host (FTA) $\neq$ standard deviation $\times$ weight of host (CUs).

Table 1.7: Intensive and extensive margins of the U.S. affiliate sales with different types of PTAs

VARIABLES	(1) intensive margin	(2) extensive margin	(3) intensive margin	(4) extensive margin	(5) intensive margin	(6) extensive margin	(7) intensive margin	(8) extensive margin
host country i GDP per capita	1.829***	0.029*	2.392***	0.030*	1.589***	0.025	1.598***	0.025
	(0.282)	(0.016)	(0.324)	(0.019)	(0.327)	(0.024)	(0.329)	(0.023)
corporate tax	-1,488.652***	10.414	-1,376.735***	19.635	-899.312**	27.192	-863.350**	24.580
	(361.479)	(19.169)	(355.151)	(19.470)	(368.049)	(20.185)	(366.744)	(20.743)
host i GDP	0.048***	-0.000	0.048***	-0.000	0.049***	-0.000	0.049***	-0.000
	(0.006)	(0.000)	(0.006)	(0.000)	(0.006)	(0.000)	(0.006)	(0.000)
PTA with U.S.	49,938.888***	1,140.673						
	(10,310.864)	(955.542)						
PTA with others (FTA)	-411.859	443.242*						
	(4,012.925)	(232.995)						
PTA with others (CUs)	-22,001.616***	124.550						
	(3,038.207)	(174.085)						
N of PTAs with others (FTA)			558.655	64.983*				
			(353.700)	(33.805)				
N of PTAs with others (CUs)			-1,424.429***	31.473				
			(396.154)	(25.681)				
weight of U.S.					28.017***	0.108	27.887***	0.118
					(2.921)	(0.161)	(2.917)	(0.160)
weight of host (FTA)					9.730***	0.142		
					(1.461)	(0.119)		
j has no PTA with USA							9.806***	0.137
							(1.454)	(0.120)
j has PTA with US							0.155	0.838
							(14.282)	(1.045)
weight of host (CUs)					6.659***	0.045	6.725***	0.040
					(1.242)	(0.097)	(1.242)	(0.098)
weight of ROW					8.157***	-0.044	7.860***	-0.023
					(1.677)	(0.126)	(1.734)	(0.123)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Host country i fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,392	1,392	1,392	1,392	1,392	1,392	1,392	1,392
R-squared	0.833	0.154	0.825	0.152	0.851	0.152	0.851	0.152
Number of host country i	48	48	48	48	48	48	48	48

[a] Dependent variable: Intensive and extensive margins of the U.S. foreign affiliate sales in odd and even numbers of columns, respectively. Columns (5) and (6) consider the market potential of host country i related to the formation of FTAs and CUs separately, detailed in expression (1.5). Columns (7) and (8) distinguish weight of host (FTA) by if the host's partner has a direct FTA with US. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

Next, baseline results in Table 1.4 are tested using an alternative definition of FDI, which measures the stock of foreign capital owned by multinational firms from eight different home countries: Finland, France, Germany, Italy, Japan, Portugal, the U.K., and the U.S. The results shown in Table 1.8 are similar to the ones in Table 1.4. In particular, column (3) reports the results using the comprehensive measure of market potential that controls for the presence of PTAs and for the relative importance of preferential markets. The results in column (3) show that the components of the market potential have their expected positive and statistically significant effects on FDI inflows. Likewise, the results outlined in column (4) confirm that the formation of PTAs leads to greater FDI inflows only if the preferential trade partners do not have a PTA with the home country. This result extends the original result applying to the U.S. as a home country to a set of developed countries while controlling for any time-invariant home-host country bilateral characteristics. Thus, strong empirical support exists for benchmark results using information on capital stocks to measure FDI for eight home countries.

Table 1.9 considers an alternative econometric approach based on the first differencing of the data over five years to account for the full impact of PTAs on FDI inflows. In this case, the measure of FDI is based on capital stocks, in line with the measures used in Table 1.8. Columns (1) through (3) show the results of the first differencing of the data over five years while column (4) also controls for the initial levels (i.e., the year of 1985 for OECD FDI stock data) of host country i's GDP per capita, corporate tax, and GDP using FDI stock data for eight home countries. The results shown in column (1) through column (3) confirm the results in Table 1.8. In particular, column (3) shows that the coefficients of the different elements of market potential ($\Delta_5$host country i's GDP, $\Delta_5$weight of home, $\Delta_5$weight of host, $\Delta_5$weight of ROW) are all positive and statistically significant. In addition, the variable controlling for the number of preferential agreements with other countries in column (2), is associated with an increase in FDI inflow into a host country i. The results shown in column (4) confirm the results related to the effect of market potential on FDI inflows, and, moreover, suggest that the larger the initial levels of host country i's GDP per capita and GDP, the larger the increase in current FDI inflows. Finally, the specification used in column

Table 1.8: Level regressions with FDI stock (eight home countries: Finland, France Germany, Italy, Japan, Portugal, the U.K. and the U.S.)[a]

VARIABLES	(1) FDI stock	(2) FDI stock	(3) FDI stock	(4) FDI stock
host country i GDP per capita	0.869***	0.960***	0.775***	0.782***
	(0.208)	(0.213)	(0.205)	(0.205)
corporate tax	-42.910	-105.658	23.084	-6.380
	(165.542)	(156.448)	(162.942)	(163.004)
host country i GDP	0.012***	0.012***	0.013***	0.013***
	(0.004)	(0.004)	(0.004)	(0.004)
PTA with home	4,153.591			
	(3,015.224)			
PTA with others	-7,184.348***			
	(2,183.465)			
N of PTAs with others		-340.836**		
		(143.616)		
weight of home			3.657**	3.853**
			(1.559)	(1.583)
weight of host			2.450**	
			(1.047)	
j has no PTA with home				2.684**
				(1.199)
j has PTA with home				1.260
				(0.784)
weight of ROW			1.769*	1.856*
			(0.959)	(1.003)
Observations	10,752	10,752	10,752	10,752
R-squared	0.207	0.202	0.227	0.228
Number of home_host2	384	384	384	384
Year fixed effects	Yes	Yes	Yes	Yes
Home-host fixed effects	Yes	Yes	Yes	Yes
Number of home-host pairs	384	384	384	384

[a] Dependent variable: Total FDI stock owned by multinational firms from eight different home countries. Column (3) considers the market potential of host country i, detailed in expression (1.10). Column (4) distinguishes weight of host by whether the host's partner country has a direct PTA with home country. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Standard errors are clustered at home-host country level.

(5) confirms that this effect of market potential on FDI depends on whether host country i's preferential partners have a PTA with the home country.

Similarly, Table 1.10 shows the results of the first differencing of the data over five years using information on the U.S. multinational foreign affiliate sales. The results confirm the baseline regression results shown in Table 1.4. All of the coefficients in column (1) through column (4) have their expected signs, except for the variable weight of ROW in columns (3) and (4), but, in the latter case, this coefficient is not statistically significant. Notice that the results in columns (1) and (2) are in line with economic intuition. The presence of PTAs with other economic partners and the number of other economic preferential partners are now associated with an increase in the U.S. FDI inflows into a host country i. The specification used in column (4) further controls for initial levels (i.e., the year of 1983 for the U.S. multinational sales data) of host country i's GDP per capita, corporate tax, and GDP. The results confirm that the greater the host country i's initial GDP per capita and initial GDP, the larger tend to be the U.S. multinational FDI inflows. As expected, the higher the host country i's initial corporate tax rate, the lower the current FDI inflows. The coefficients of the variables $\Delta_5$host country i and $\Delta_5$weight of U.S. are positive and statistically significant at the 99 percent significance level, and the coefficient of the variable $\Delta_5$weight of host is positive and statistically significant at the 95 percent significance level. The results shown in column (5) confirm that enlarging market potential through PTA formation only applies if preferential partners do not have a PTA with the U.S. These results confirm our benchmark results shown in Table 1.4, suggesting that they are robust to different measures of FDI and to different econometric strategies.

The robustness tests above confirm the baseline results using OECD FDI stock data and considering an alternative econometric approach based on the first differencing of the data over five years. However, the concern about the endogeneity of the decision to form a PTA and activities of multinational firms may still exist, as suggested by the results shown in Blanchard and Matschke (2015). Their results suggest the presence of simultaneity between the decision of the host country i to form a PTA with the U.S., and the sales of U.S. multinational foreign affiliates. It can then be argued that having higher affiliate sales in a

Table 1.9: First differencing over 5 years with FDI stock[a]

VARIABLES	(1) Δ_5FDI stock	(2) Δ_5FDI stock	(3) Δ_5FDI stock	(4) Δ_5FDI stock	(5) Δ_5FDI stock
$\Delta_5$host country i GDP per capita	0.422***	0.303***	0.377***	0.117	0.117
	(0.111)	(0.103)	(0.091)	(0.107)	(0.107)
$\Delta_5$corporate tax	-4.819	38.687	-39.481	-70.153	-76.180
	(96.429)	(93.151)	(93.581)	(76.463)	(78.596)
$\Delta_5$host country i GDP	0.010***	0.011***	0.011***	0.006**	0.006**
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
initial country i GDP per capita				0.093***	0.094***
				(0.025)	(0.025)
initial corporate tax				-33.560	-32.246
				(78.596)	(78.632)
initial host country i GDP				0.002**	0.002**
				(0.001)	(0.001)
PTA with home	1,477.982				
	(1,391.535)				
PTA with others	731.678				
	(1,230.914)				
N of PTAs with others		246.956***			
		(79.051)			
$\Delta_5$weight of home			2.305**	2.156**	2.203**
			(0.963)	(0.938)	(0.940)
$\Delta_5$weight of host			1.173**	1.052**	
			(0.539)	(0.505)	
j has no PTA with home					1.163**
					(0.590)
j has PTA with home					0.585
					(0.420)
$\Delta_5$weight of ROW			1.365**	1.035*	1.085*
			(0.582)	(0.528)	(0.562)
Observations	8,832	8,832	8,832	8,832	8,832
R-squared	0.063	0.072	0.070	0.097	0.098
Year fixed effects	Yes	Yes	Yes	Yes	Yes

[a] Dependent variable: First difference of FDI stock over 5 years. Column (3) considers the first difference of each component of the market potential of host country i. Column (4) additionally controls for the initial levels of host country i GDP per capita, corporate tax, and GDP. Column (5) distinguishes weight of host by whether the host's partner country has a direct PTA with home country. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Standard errors are clustered at home-host country level.

Table 1.10: First differencing over 5 years with U.S. sales[a]

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Δ_5U.S. sales	Δ_5U.S. sales	Δ_5U.S. sales	Δ_5U.S. sales	Δ_5U.S. sales
$\Delta_5$host country i GDP per capita	1.203***	1.060***	0.897***	0.869***	0.880***
	(0.214)	(0.246)	(0.248)	(0.285)	(0.286)
$\Delta_5$corporate tax	-195.173	-64.911	-106.063	-106.176	-71.096
	(235.683)	(256.477)	(250.415)	(234.450)	(236.702)
$\Delta_5$host country i GDP	0.043***	0.044***	0.043***	0.030***	0.030***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
initial country i GDP per capita				0.138***	0.135***
				(0.037)	(0.037)
initial corporate tax				-221.587**	-224.955**
				(102.067)	(102.800)
initial host country i GDP				0.016***	0.016***
				(0.002)	(0.002)
PTA with U.S.	30,863.717***				
	(5,035.407)				
PTA with others	4,212.887***				
	(1,148.680)				
N of PTAs with others		460.038***			
		(108.294)			
$\Delta_5$weight of U.S.			11.365***	10.162***	10.145***
			(2.101)	(1.973)	(1.973)
$\Delta_5$weight of host			5.641***	3.028**	
			(1.273)	(1.486)	
j has no PTA with US					3.167**
					(1.486)
j has PTA with US					-13.788
					(11.681)
$\Delta_5$weight of ROW			5.231***	1.663	1.344
			(1.606)	(1.663)	(1.685)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1,200	1,200	1,200	1,200	1,200
R-squared	0.302	0.240	0.261	0.340	0.341

[a] Dependent variable: First difference of the U.S. foreign affiliate sales over 5 years. Column (3) considers the first difference of each component of the market potential of host country i. Column (4) additionally controls for the initial levels of host country i GDP per capita, corporate tax, and GDP. Column (5) distinguishes weight of host by whether the host's partner country has a direct PTA with US. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

host country i could lead the U.S. and the host country to form a PTA. We account for this potential simultaneity by employing an IV method to correct for the potential endogeneity bias of PTA formation.

First, this paper estimates the predicted probability of formation of PTAs by employing probit and linear probability models following the benchmark specifications used in Baier and Bergstrand (2004) and in Egger and Larch (2008). The idea is to use their models, which study the decision of a country-pair to form a PTA, to gauge the probability that the U.S. and the host-country have a PTA in a particular year. As such, we follow their models in selecting the IVs. More specifically, the probit and linear probability models include the following IV variables: bilateral market size using both countries' real GDP (Bilateral market size), size similarity of two countries in terms of their real GDP (Similarity in GDP); the absolute difference in factor endowment ratio (DKL); the squared value of DKL (SQDKL); relative factor endowment difference between the rest of the world and a given country-pair (DROWKL); the log of inverse of the distance between two countries (Inverse of distance); and the remoteness of a country-pair from the rest of the world (Remoteness).

The specification used can be described as follows:

$$
\begin{aligned}
Pr(PTA_{ijt}=1) = \phi[\theta_1 \cdot & \underbrace{ln(RGDP_{it}+RGDP_{jt})}_{\text{Bilateral market size}} \\
& + \theta_2 \cdot \underbrace{ln\left(1-\left[\frac{RGDP_{it}}{(RGDP_{it}+RGDP_{jt})}\right]^2-\left[\frac{RGDP_{jt}}{(RGDP_{it}+RGDP_{jt})}\right]^2\right)}_{\text{Similarity in GDP}} \\
& + \theta_3 \cdot \underbrace{\left|ln\frac{K_{it}}{L_{it}}-ln\frac{K_{jt}}{L_{jt}}\right|}_{\text{DKL}} + \theta_4 \cdot \underbrace{\frac{1}{2}\sum_{k=i,j}\left|ln\frac{K_{kt}}{L_{kt}}-ln\frac{K_{ROW,t}}{L_{ROW,t}}\right|}_{\text{DROWKL}} \\
& + \theta_5 \underbrace{ln(1/\tau_{ij})}_{\substack{\text{Inverse}\\ \text{of}\\ \text{distance}}} + \theta_6 \underbrace{remote_{ij}}_{\text{Remoteness}},
\end{aligned}
\tag{1.13}
$$

where $\phi(.)$ denotes the cumulative probability function. The two countries' remoteness from the rest of the world is defined as follows:

$$remote_{ij} \equiv continent_{ij} \cdot \frac{1}{2}\left[ln \sum_{k \neq i,j} \frac{\tau_{ik}}{N-1} + ln \sum_{k \neq i,j} \frac{\tau_{jk}}{N-1}\right], \tag{1.14}$$

where $continent_{ij}$ is a dummy variable that is equal to one if two countries i and j are located in the same continent and zero otherwise. Also, τ_{ik} and τ_{jk} are the bilateral weighted distance between country i and the third country k and between country j and the third country k, respectively.

Table 1.11 reports the estimates of specification (1.13) based on probit and linear probability models. The probit model results in column (1) show that country-pairs with larger market sizes and more similar economies in terms of real GDP are more likely to form a PTA. Also, countries geographically closer are significantly more likely to form a PTA, while we do not find a significant positive effect of the remoteness of a country-pair from the rest of the world on PTA formation. In the case of relative factor endowments, we do not find a significant effect on the formation of PTA if two countries face a greater difference in relative factor endowments. However, two countries are likely to form a PTA if there is a relatively large difference in relative factor endowments between two countries and the rest of the world. Column (2) shows the estimates of the linear probability model with country-pair fixed effects. The results are qualitatively similar to the ones in the probit model.

In the second stage of the endogeneity analysis, we use the predicted probability of PTA formation to construct the terms of the market potential variable following expression (1.2), i.e., predicted weight of U.S., predicted weight of host, and predicted weight of ROW. Two types of predicted market potential variables are calculated based on the predicted probability of PTAs obtained from probit and linear probability models shown in Table 1.11, respectively.

The effect of the predicted terms of market potential on U.S. foreign affiliate sales is estimated using our preferred specification also used in Column (3) of Table 1.4. Columns (1) and (2) of Table 1.12 show the estimation results using the predicted market potential variable based on probit and linear probability models, respectively. In Column (1), the

Table 1.11: The estimation of the probability of PTA[a]

	(1) probit	(2) linear probability
VARIABLES	PTA	PTA
Bilateral market size	3.072***	0.763***
	(0.0834)	(0.0113)
Similarity in GDP	0.558***	0.450***
	(0.0975)	(0.0220)
Difference in KL endowment ratio	0.0839	0.0243
	(0.202)	(0.0280)
Squared difference in KL endowment ratio	0.496***	0.0732***
	(0.0491)	(0.00677)
Difference in KL endowment ratio from the ROW	1.516***	0.212***
	(0.165)	(0.0300)
Inverse of distance	7.912***	-
	(0.289)	
Remoteness	0.0749	-
	(0.0639)	
Country-pair fixed effects	No	Yes
Observations	35,280	35,280

[a] Dependent variable: Preferential Trade Agreement (PTA) dummy that is equal to one if country i and country j form a PTA at year t. Column (1) estimates the determinants of PTA based on probit model. Column (2) estimates the determinants of PTA based on linear probability model with country-pair fixed effects. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Standard errors are reported in the parentheses.

instrumented weight of host exhibits its expected positive and significant effect on FDI even after controlling for the potential simultaneity between host country i's PTA status and U.S. foreign affiliate sales. This implies that the formation of PTAs by a host country i with other economic partners enhances the U.S. foreign affiliate sales in the host country. Column (2) confirms this result while measuring the terms of predicted market potential based on the linear probability model. These results further confirm the robustness of our main findings which indicate that the larger the preferential markets to which a country has access, the larger its FDI inflows.

1.6 Conclusion

The world economic integration process has led to the formation of many plurilateral PTAs where more than two countries are members of the same preferential trade arrangement. Consequently, the investigation of the effects of the formation of PTAs on FDI flows requires considering whether the host country has a PTA with the home country and the importance of all additional markets that the host economy can export on a preferential base.

Using the U.S. multinational foreign affiliate sales data provided by the BEA, this paper investigates the role played by PTA formation in attracting inflows of FDI. Specifically, the paper investigates the relationship between market potential and FDI by incorporating new PTA information for the last 13 years from the year 2000 to 2012, while controlling for different levels of heterogeneity regarding the types of PTAs (FTA or CUs), the margin of FDI (intensive or extensive), and regarding the presence of PTAs between a host country's preferential partners and the home economies. Our baseline results show that the larger the preferential markets to which a country has access, the larger the FDI inflows the country receives. Importantly, this average result holds if preferential partners do not also have a PTA in place with the home country. This empirical result implies that PTAs enlarge the host country's market by providing multinational firms access to other preferential markets.

Furthermore, this paper finds that the formation of CUs tends to promote FDI inflows more than the formation of FTA does. The formation of FTAs does not promote FDI inflows if the partner countries also have an FTA with the FDI-originating (home) country. Thus, it represents another example where the interdependence across PTAs plays a significant economic role. Our results are robust to many robustness tests. In addition to the results discussed in Tables 1.7-1.12, we show in the appendix (Table A1) that our results are also robust to including partial-scope agreements in the measure of market potential, dividing weight of host (CUs) into weight of host (EU) and weight of host (non EU), dropping observations with zero FDI inflows, and to adopting different year lags in measuring the external margin of FDI inflows.

Table 1.12: Addressing potential endogeneity of PTA: 2SLS estimates[a]

VARIABLES	(1) U.S. affiliate sales	(2) U.S. affiliate sales
host country i GDP per capita	-1.033*	-0.320
	(0.553)	(0.422)
corporate tax	855.155	150.428
	(560.967)	(414.221)
host GDP	0.062***	0.056***
	(0.007)	(0.005)
weight of U.S.	93.099***	58.204***
	(15.595)	(7.064)
weight of host	27.327***	20.683***
	(3.902)	(2.953)
weight of ROW	2.098	8.855*
	(10.161)	(5.237)
Observations	1,440	1,440
Year fixed effects	Yes	Yes
Host country *i* fixed effects	Yes	Yes
Number of host country *i*	48	48

First stage estimates

	(1)	(2)
Dependent variable: weight of U.S.		
predicted weight of U.S.	0.425**	16.834***
	(0.197)	(1.443)
Dependent variable: weight of host		
predicted weight of host	0.530***	0.547***
	(0.030)	(0.035)
Dependent variable: weight of ROW		
predicted weight of ROW	0.262**	0.575***
	(0.120)	(0.071)

[a] Dependent variable: Total U.S. multinational foreign affiliate sales. Columns (1) and (2) report the results using predicted market potential based on probit and linear probability models, respectively. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

Table A1. Additional robustness checks

VARIABLES	(1) U.S. affiliate sales	(2) U.S. affiliate sales	(3) U.S. affiliate sales	(4) Extensive Margin	(5) Extensive Margin
host country i GDP per capita	1.547***	1.544***	1.286***	0.028	0.050
	(0.312)	(0.319)	(0.291)	(0.025)	(0.034)
corporate tax	-711.673*	-908.628**	-974.621***	54.241***	71.830***
	(376.991)	(360.712)	(365.810)	(20.654)	(23.962)
host country i GDP	0.049***	0.050***	0.055***	-0.000	0.000
	(0.006)	(0.006)	(0.007)	(0.000)	(0.000)
weight of U.S.	28.703***	27.789***	28.347***	0.174	0.236
	(2.823)	(2.817)	(2.739)	(0.211)	(0.244)
weight of host			6.525***	0.018	0.059
			(1.193)	(0.095)	(0.124)
weight of host (FTA)	10.224***	9.259***			
	(1.381)	(1.420)			
weight of host (CUs)	6.989***				
	(1.187)				
weight of host (EU)		6.662***			
		(1.181)			
weight of host (non EU)		4.739***			
		(1.464)			
weight of host (Partial)	-5.256**				
	(2.267)				
weight of ROW	10.493***	7.159***	6.622***	-0.265*	-0.478**
	(1.881)	(1.638)	(1.653)	(0.150)	(0.208)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Host country i fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1,440	1,440	1,433	1,344	1,296
R-squared	0.847	0.847	0.846	0.178	0.224
Number of host country i	48	48	48	48	48

The dependent variables in Columns (1), (2), and (3) are the total U.S. multinational foreign affiliate sales. Column (1) reports weight of host (Partial Agreements) in addition to FTA and CUs. Column (2) splits weight of host (CUs) into two parts: weight of host (EU) and weight of host (nonEU). Column (3) drops the zero US affiliate sales observations. The dependent variable in Column (4) is the extensive margin based on 2-year lags. The dependent variable in Column (5) is the extensive margin based on 3-year lags. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

Bibliography

[1] Anderson, J. E., Larch, M., & Yotov, Y. V. (2019). Trade and investment in the global economy: A multi-country dynamic analysis. European Economic Review, 120, 103-311.

[2] Ariua, Andrea, Breinlich, Holger, Corcos, Gregory, and Mion Giordano, 2019. The interconnections between services and goods trade at the firm-level. Journal of International Economics 116, 173-188.

[3] Arnold, Jens M., Javorcik, Beata S., Mattoo, Aaditya, 2011. Does services liberalization benefit manufacturing firms?: Evidence from the Czech Republic. Journal of International Economics 85, 136-146.

[4] Bagwell, Kyle, Bown, Chad P., Staiger, Robert W., 2016. Is the WTO Passé? Journal of Economic Literature 54(4), 1125-1231.

[5] Baier, Scott L., Bergstrand, Jeffrey H., 2007. Do free trade agreements increase members' international trade? Journal of International Economics 71, 72-95.

[6] Baier, Scott L., Bergstrand, Jeffrey H., Feng, Michael, 2014. Economics integration agreements and the margins of international trade. Journal of International Economics 93, 339-350.

[7] Bernard, A. B., Jensen, J. B., Redding, S. J., & Schott, P. K. (2009). The Margins of US Trade. The American Economic Review, 99(2), 487-493.

[8] Beugelsdijk, Sjoerd, Hennart, Jean-Francois, Slangen, Arjen, Smeets, Roger, 2010. Why and how FDI stocks are a biased measure of MNE affiliate activity. Journal of International Business Studies 41(9), 1444-1459.

[9] Blanchard, Emily, Matschke, Xenia, 2015. U.S. multinationals and preferential market access. The Review of Economics and Statistics 97(4), 839-854

[10] Chen, Maggie X., 2009. Regional economic integration and geographic concentration of multinational firms. European Economic Review 53(3), 355-375.

[11] Deltas, George, Desmet, Klaus, Facchini, Giovanni, 2012. Hub-and-spoke free trade areas: theory and evidence from Israel. Canadian Journal of Economics 12, 942-977.

[12] Egger, Peter, Larch, Mario, 2008. Interdependent preferential trade agreement memberships: An empirical analysis. Journal of International Economics, 76, 384-399.

[13] Ekholm, K., Forslid, R., & Markusen, J. R. (2007). Export-Platform Foreign Direct Investment. Journal of the European Economic Association, 5(4), 776-795.

[14] Facchini, Giovanni, da Silva, Peri, Willmann, Gerald, 2013. The Customs Union Issue: Why do we observe so few of them? Journal of International Economics 90, 136-147.

[15] Grossman, Gene M., Helpman, Elhanan., Szeidl, Adam., 2006. Optimal integration strategies for the multinational firm. Journal of International Economics 70, 216-238.

[16] Hanson, Gordon, 2005. Market Potential, Increasing Returns, and Geographic Concentration. Journal of International Economics 67(1), 1-24.

[17] Harris, Chauncy D., 1954. The Market as a Factor in the Localization of Industry in the United States. Annals of the Association of American Geographers 44(4), 315-348.

[18] Head, Keith, Mayer, Thierry, 2003. The empirics of Agglomeration and Trade. CEPII, Working Paper No 2003-15

[19] Head, Keith, Mayer, Thierry, 2004. Market Potential and the Location of Japanese Investment in Europe. The Review of Economics and Statistics 86(4), 959-972.

[20] Helpman, Elhanan., 1984. A simple theory of international trade with multinational corporations. Journal of Political Economy 92, 451-472.

[21] Helpman, Elhanan., Melitz, Marc., Yeaple, Stephen., 2004. Export versus FDI with heterogeneous firms. American Economic Review 94, 300-316.

[22] Hummels, David, Klenow, Peter J., 2005. The variety and quality of a nation's exports. American Economic Review 95, 704-723.

[23] Javorcik, Beata S., 2004. Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. American Economic Review 94, 605-627.

[24] Kehoe, T. J., & Ruhl, K. J. (2013). How Important Is the New Goods Margin in International Trade? The Journal of Political Economy, 121(2), 358-392.

[25] Krugman, Paul, 1992. A dynamic spatial model. National Bureau of Economic Research Working Paper #4219.

[26] La Porta, Rafael, Florencio Lopez-de-Silanes, Andrej Shleifer, and Robert W. Vishny. (1997). Legal Determinants of External Finance Legal Determinants of External Finance. The Journal of Finance, L11(3), 1131-1150.

[27] Porta, R. L., La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R. W. (1988). Law and Finance. The Journal of Political Economy, 106(6), 1113-1155.

[28] Liu, Xueping, Ornelas, Emanuel, 2014. Free Trade Agreements and Consolidation of Democracy. American Economic Journal: Macroeconomics 6(2), 29-70.

[29] Magee, C. S. P. (2008). New measures of trade creation and trade diversion. Journal of International Economics, 75(2), 349-362.

[30] Markusen, James R., 1984. Multinationals, multi-plant economies, and the gains from trade. Journal of International Economics 16, 205-226.

[31] Melitz, Marc J., 2003. The impact of trade on intra-industry reallocations and aggregate industry productivity. Econometrica, 71(6), 1695-1725.

[32] Motta, M., Norman, G. (1996). Does Economic Integration Cause Foreign Direct Investment? International Economic Review, 37(4), 757-783.

[33] Nguyen, A. T. N. (2019). A global analysis of factors impacting the intensive and extensive margins of bilateral foreign direct investment. World Economy, 42(9), 2649-2667.

[34] Ornelas, Emanuel, 2007. Exchanging market access at the outsiders' expense - the case of customs unions. Canadian Journal of Economics 40, 207-224.

[35] Pierce, Justin R., Schott, Peter K., 2016. The surprisingly swift decline of US manufacturing employment. American Economic Review 106(7), 1632-1662.

[36] Roy, J. (2010). Do customs union members engage in more bilateral trade than Free-Trade agreement members?: Free-Trade agreements and customs unions. Review of International Economics, 18(4), 663-681.

[37] Tinbergen, J., 1962. Shaping the World Economy; Suggestions for an International Economic Policy. Books (Jan Tinbergen). Twentieth Century Fund, New York.

[38] Wooldridge, Jeffrey M., 2000. Introductory Econometrics. South-Western, Chicago, IL.

[39] Wooldridge, Jeffrey M., 2010. Econometric Analysis of Cross Section and Panel Data, Second edition. MIT Press, Cambridge, MA.

[40] Yeaple, S.R., 2003. The complex integration strategies of multinational firms and cross-country dependencies in the structure of foreign direct investment, Journal of International Economics 60, 293-314.

Chapter 2

U.S. Globalization Issue Reconsidered: The Role of FDI in Generating Net Benefits

2.1 Introduction

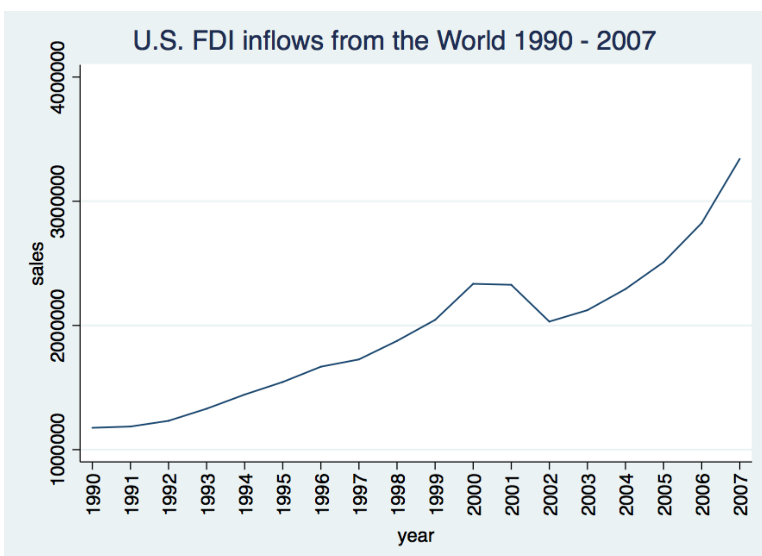
The process of integration of the world economy has been one of the largest developments of the last century, culminating with the formation of a permanent multilateral institution (The World Trade Organization, henceforth the WTO) in 1995 to regulate and enforce international trade rules and the formal acceptance of China as a member of the rules-based international trade system sponsored by the WTO in 2001. As a result of this integration process, the past two decades have seen an unprecedented increase in world merchandise trade, which has reached U.S.$19.45 trillion in 2018.[1] But, the substantial increase in trade in goods across countries is just one of the facets of the overall economic integration process. In fact, economies have also become more integrated through trade in services, in particular with a spectacular increase in foreign direct investments (FDI). UNCTAD[2] suggests that FDI flows have increased sevenfold in the last three decades, suggesting an important role

[1]Source: UNCTAD (2019). The UNCTAD Handbook of Statistics 2019, UN, New York, 2019.
[2]Source: UNCTADSTAT foreign direct investment data (http://unctadstat.unctad.org/EN/)

played by this modality of trade in services in the global integration process.

In this paper, we extend the empirical framework developed by Autor, Dorn, and Hanson (2013, henceforth ADH) to investigate the effects played by FDI on U.S. local labor market outcomes between 1991 and 2007. ADH (2013) find that increases in U.S. exposure to imports from China can explain a substantial fraction of the drop in the share of manufacturing employment across U.S. local labor markets. Our empirical strategy is aimed at empirically testing the multiple facets of U.S. local labor market exposure to international integration by considering not only the effects of trade in goods but also accounting for the effects of FDI outflows as well as the effects of FDI inflows. Data from the Bureau of Economic Analysis (BEA) suggest that the U.S. economy has become the largest recipient of FDIs[3] in the world, as well as has been the main source of FDIs.[4] Measuring FDI flows using affiliate sales of multinational corporations suggests that U.S. FDI inflows reached U.S.$3.3 trillion in 2007, and the value of U.S. outflows of FDI reached U.S.$4.7 trillion in 2007.

Figure 2.1: Total U.S. FDI inflows from 1990 to 2007 (in millions of 2007 US$)

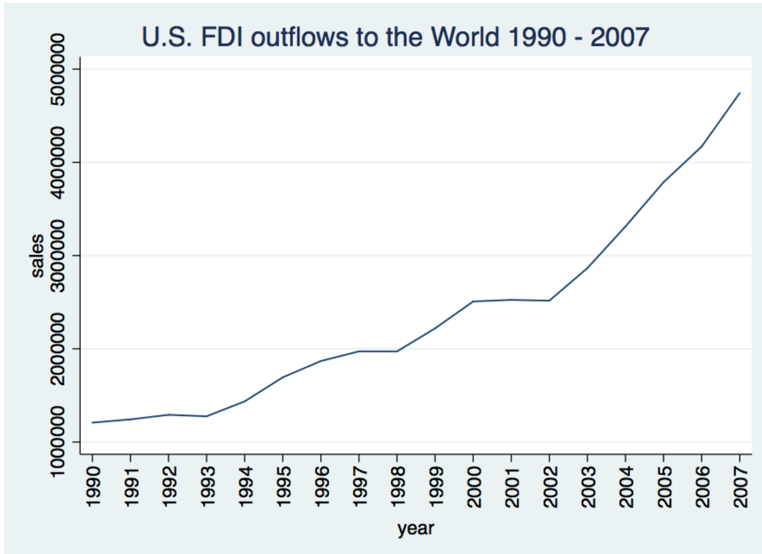


As expected, figures 2.1 and 2.2 also suggest that FDIs directly involving the U.S. economy have increased significantly during the last three decades, where we notice that U.S.

[3]In our paper, recipient country and host country will be used interchangeably.

[4]According to SelectUSA.org, U.S. is the largest FDI recipient country of FDI flows and FDI stock.

Figure 2.2: Total U.S. FDI outflows from 1990 to 2007 (in millions of 2007 US$)



FDI inflows (outflows) have increased threefold (fivefold) in the last 20 years. These represent empirical facts that corroborate the well-accepted key role played by this economy in world affairs.[5]

Our measure of FDI relies on multinationals' affiliate sales provided by the BEA, and the data cover the relationship between FDI and labor market outcomes from 1991 to 2007. Our benchmark results suggest that U.S. exposure to FDI inflows tends to increase the share of manufacturing employment across local labor markets, while exposure to FDI outflows tends to reduce the share of manufacturing employment in the U.S.

We find that the average increase in U.S. exposure to imports from China is associated with an 0.089 percentage point decrease in the share of manufacturing employment across local labor markets. However, this negative effect of imports of Chinese goods on U.S. employment is mostly offset by U.S. global export expansions. The average increase in U.S. exposure to export expansions is associated with an 0.079 percentage point increase in

[5]In this paper, we do not address questions related to the special role that FDIs may play in economic development. However, we note that this modality of trade in services has become an important policy agenda for nations to better integrate their economies into the global economic system. As an example, Javorcik (2004) and Baldwin et al. (2005) find that FDIs have positive productivity spillover effects to domestic firms, and it stimulates economic growth of the recipients' economies.

the share of manufacturing employment across local labor markets. These estimates suggest that the net effect of U.S. exposure to imports from China and exports on the manufacturing employment share is almost balanced at the local labor market level.

In addition to trade in goods, we examine the employment effects of U.S. exposure to FDI inflows and FDI outflows. Our results suggest that the average increase in U.S. exposure to FDI inflows is associated with a 0.108 percentage point increase in the share of manufacturing employment. In comparison, the average increase in U.S. exposure to FDI outflows is associated with a 0.049 percentage point decrease in the share of manufacturing employment. Overall, the net employment effect of U.S. exposure to international trade in goods and services is positive during the periods from 1991 to 2007. In fact, we find that the average increase in U.S. exposure to international trade in goods and services is associated with a 0.049 percentage point increase in the share of manufacturing employment.

We also quantify the employment impact of U.S. exposure to international trade in goods and services following the method introduced by Acemoglu et al. (2016) and find that the implied employment changes due to U.S. exposure to international trade in goods and services are about 1.36 million over the period 1991-2007. Thus, our results suggest that accounting for changes in U.S. exposure to both goods and services (FDI) is essential to understand the net effects of globalization on U.S. labor markets.

Our paper contributes to two main branches of the literature that examine the effects of economic integration on labor market outcomes. The first branch focuses mostly on the effects of trade in goods on labor markets. ADH (2013) analyze the effects of rising Chinese import competition on U.S. local labor markets and find that one-quarter of the aggregate decline in the U.S. share of manufacturing employment can be explained by Chinese import competition directly related to economic growth in China. Pierce and Schott (2016) show that a substantial share of the decline in U.S. employment in the manufacturing sector can be traced to the reduction in the uncertainty of U.S. trade policy towards China after this country joined the WTO in 2001. Acemoglu et al. (2016) also find that U.S. imports from China have led to substantial employment losses in the manufacturing sectors, but, importantly, they highlight that these facts are magnified by considering the strong effects of Chinese competition on U.S. downstream industries. More recently, Feenstra, Ma, and Xu (2017) find that the effects of U.S. export expansion tend to significantly counter the negative effects of increased Chinese import competition, proving that considering trade with China and other countries may mitigate the negative effects of globalization on local labor markets.

Our work is also related to the literature studying the effects of FDIs on labor market outcomes. Interestingly, this literature tends to find mixed results of the effects of FDI inflows in the recipient countries. Axarloglou and Pournarakis (2007) show that U.S. inflows of FDIs in printing and publishing, transportation equipment, and in the production of instruments had positive effects on local employment and wages, while inflows of FDI in leather and stone/clay/glass had adverse effects using industry-level data from 1974 to 1994. Figlio and Blonigen (1999) find that FDI inflows in South Carolina raised local real wages much more than domestic investment did during the period from 1980 to 1995.[6] Instead, Chen (2011) analyzes the effect of U.S. FDI inflows by controlling for information about the country of origin, and by using information related to mergers and acquisitions (M&A) data from 1979 to 2006. She finds that foreign acquisitions of U.S. firms involving firms based in other developed countries tend to increase employment and sales of acquired firms, while M&A involving firms with headquarters in developing countries tends to decrease both revenues and the total number of employees.[7]

To the best of our knowledge, our paper is the first to empirically test the impact of economic integration by jointly considering the effects of trade in goods and in an important

[6]Moreover, Waldkirch et al. (2009) explore the impact of FDI inflows on employment in Mexico and they find that FDI inflows had a positive impact on manufacturing employment, especially in export-oriented industries using highly disaggregated FDI and employment data covering about 200 manufacturing industries from 1994 to 2006.

[7]The literature usually finds that outflows of FDIs tend to have negative effects on some labor markets outcomes in the origin country. Becker et al. (2005) find strong evidence that jobs at foreign locations substitute for employment at parents' companies irrespective of the host country, using information about German and Swedish multinational enterprises. Mariotti et al. (2003) consider the destination of FDI outflows and show that larger employment in affiliates of Italian multinationals located in developing countries is associated with lower labor intensity in Italy at the regional and industry levels. Debaere, Lee, and Lee (2010) find that outward FDI to less-advanced countries decreases a company's employment growth rate, especially in the short run, while outward FDI to more-advanced countries does not consistently affect employment growth in any significant way.

modality of trade in services. Moreover, we consider the effects at the local labor markets since, instead, at the industry level, an outflow of FDI may decrease employment in that industry, but, at the local labor market, we may see no change in employment as workers tend to stay in their local markets after being exposed to a negative economic shock. Our results strongly suggest that U.S. exposure to FDI inflows tends to increase the share of manufacturing employment, while U.S. exposure to FDI outflows tends to reduce manufacturing employment share across U.S. local labor markets. Moreover, we also observe that U.S. exposure to FDI inflows tend to increase the average weekly wage and reduce the number of unemployed workers at the local labor market level. On the other hand, U.S. exposure to FDI outflows tend to decrease the average weekly wage and tend to increase the number of unemployed workers. Overall, the net employment effect of international trade exposure in goods and services is positive during the periods from 1991 to 2007. We find that the average increase in exposure to international trade in goods and services is associated with a 0.049 increase in the share of manufacturing employment.

The remainder of this paper is organized as follows. Section 2 discusses the empirical methodology, which includes the econometric model and the description of the main variables. Section 3 describes the data used in the analysis. Section 4 provides the main econometric results. Section 5 concludes the paper.

2.2 Methodology

This paper investigates the effects of trade in goods and services on U.S. local labor market outcomes. As emphasized by Acemoglu et al. (2016), the analysis at the local labor market level can capture the reallocation and demand effects that occur across the local labor markets. ADH (2013) construct the measure of local labor market exposure to import competition and quantify these reallocation effects at the local labor market level. In this paper, we extend ADH (2013) and Acemoglu et al. (2016) by also considering the impact of international trade shocks on labor markets due to U.S. FDI inflows and FDI outflows. We define local labor markets by following the definition used in ADH (2013), where the U.S. economy is represented by 722 commuting zones (CZs) based on Tolbert and Sizer (1996).

The effects of FDI flows and trade in goods at the local labor market requires us to first define the penetration ratios at the industry level. In this case, we follow Acemoglu et al. (2016) and define the penetration ratios of FDI flows and trade in goods at the industry level as follows:

$$\Delta FDIinf_{j,t} = \frac{\Delta \text{inwardFDI}_{j,t}}{Y_{j,t_0} + M_{j,t_o} - E_{j,t_0}} \tag{2.1}$$

$$\Delta FDIout_{j,t} = \frac{\Delta \text{outwardFDI}_{j,t}}{Y_{j,t_0}} \tag{2.2}$$

$$\Delta IP_{j,t} = \frac{\Delta \text{M}^{UC}_{j,t}}{Y_{j,t_0} + M_{j,t_o} - E_{j,t_0}} \tag{2.3}$$

$$\Delta EP_{j,t} = \frac{\Delta \text{X}_{j,t}}{Y_{j,t_0}}, \tag{2.4}$$

where $\Delta\text{inwardFDI}_{j,t}$ and $\Delta\text{outwardFDI}_{j,t}$ represent the change in industry-level FDI inflows, and FDI outflows during the time period t (either 1991-1999, or 1999-2007), respectively. The exposure to FDI inflows at the industry level is measured as the ratio between the industry-level FDI inflows and the initial domestic absorption, which consists of the industrial real shipment, Y_{j,t_0}, plus industrial real net imports, $M_{j,t_o} - E_{j,t_0}$, both measured at the base year of 1991. FDI inflows penetration ratio specified in (2.1), therefore, measures the actual increase in the change in U.S. exposure to FDI inflows that each U.S. manufacturing industry j experiences. Also, the exposure to FDI outflows at the industry level is measured as the ratio between the industry-level FDI outflows and the real industrial shipment at the base year. FDI outflows penetration ratio specified in (2.2) therefore, measures the share of U.S. FDI outflows relative to the total industrial output in the U.S.

As for trade in goods, the exposure to imports from China at the industry level is measured as the ratio between the industry-level imports from China and the initial domestic absorption. The import penetration ratio specified in (2.3), therefore, measures the actual increase in import exposure that each U.S. manufacturing industry j experiences. Similarly, the change in U.S. exposure to exports at the industry level is measured as the ratio between the industry-level global exports and the real shipment evaluated at the base year. The export penetration ratio specified in (2.4), therefore, measures the share of U.S. exports relative to the total industrial output in the U.S.

Based on the FDI inflows and FDI outflows penetration ratios specified in (2.1) and (2.2) and following the methodology introduced in Feentra, Ma, and Xu (2017), we construct the measures of local labor market exposure to FDI inflows and FDI outflows as follows:

$$\Delta FDIinf_{i,t}^{CZ} = \sum_j \frac{L_{i,j,t_0}}{L_{i,t_0}} \Delta FDIinf_{j,t_0} \tag{2.5}$$

$$\Delta FDIout_{i,t}^{CZ} = \sum_j \frac{L_{i,j,t_0}}{L_{i,t_0}} \Delta FDIout_{j,t_0}, \tag{2.6}$$

where i denotes a commuting zone, and L_{ijt_0}/L_{it_0} is industry j's start-of-period share of total employment in CZ i. So, the specifications (2.5) and (2.6) ensure that the difference in FDI inflow and FDI outflow exposures across commuting zones stems entirely from the shares of local labor market's industry employment at the start of period t.

As for trade in goods, we borrow the measures of CZ-level U.S. exposure to imports from China and exports used in Feentra, Ma, and Xu (2017), which are described by the following expressions:

$$\Delta IP_{i,t}^{CZ} = \sum_j \frac{L_{i,j,t_0}}{L_{i,t_0}} \Delta IP_{j,t_0} \tag{2.7}$$

$$\Delta EP_{i,t}^{CZ} = \sum_j \frac{L_{i,j,t_0}}{L_{i,t_0}} \Delta EP_{j,t_0}, \tag{2.8}$$

where $\Delta IP_{j,t_0}$ and $\Delta EP_{j,t_0}$ are industrial import and export penetration ratios specified in (2.3) and (2.4).

We extend the approach used in Feentra, Ma, and Xu (2017) to identify the effects of trade in goods and services on local labor market outcomes. More precisely, we estimate the following specification:

$$\Delta L_{i,t}^{m} = \alpha_t + \beta_1 \Delta IP_{i,t}^{CZ} + \beta_2 \Delta EP_{i,t}^{CZ} + \beta_3 \Delta FDIinf_{i,t}^{CZ} + \beta_4 \Delta FDIout_{i,t}^{CZ} + \gamma X_{i,t_0}^{CZ} + \gamma_r + e_{i,t}, \tag{2.9}$$

where $\Delta L_{i,t}^{m}$ is the annual log change in manufacturing employment share of the working-age population in commuting zone i over time period t. Following ADH (2013) and Acemoglu et al. (2016), we stack the first differences for the two subperiods, 1991-1999 and 1999-2007. All variables in changes in the specification (2.9) is annualized.[8] We also include α_t, time fixed effects, X_{i,t_0}^{CZ}, CZs' start-of-period labor force and demographic composition that potentially affect manufacturing employment, and γ_r, a set of census division dummies in all regressions.

Our main specification represented by expression (2.9), however, is subject to the endogeneity of the trade exposure measures, including both trade in goods and trade in services. The U.S. employment and the changes in U.S. exposure to imports from China, exports, FDI inflows, and FDI outflows could be affected by U.S. shocks. For instance, U.S. negative demand shock may lead to falling U.S. employment, lower U.S. imports from China, and lower U.S. FDI inflows in the relevant sectors. On the other hand, U.S. positive supply shocks that raise firm efficiency may increase employment, U.S. exports, and U.S. FDI outflows. These U.S. shocks could affect U.S. employment, U.S. imports from China, U.S. exports, U.S. FDI inflows, and U.S. FDI outflows simultaneously, and this could lead to endogeneity bias in our estimations.

We borrow the IVs developed by Feenstra, Ma, and Xu (2017) to control for the endogeneity of variables measuring U.S. exposure to imports from China and exports. In these cases, the CZ-level U.S. exposure to goods imported from China is instrumented with the CZ-level other eight high-income economies exposure to goods imported from China, while the CZ-level U.S. exposure to exports of goods is instrumented with the CZ-level other eight high-income economies exposure to exports. As for trade in services, we use predicted values for U.S. imports and exports to control for the endogeneity in U.S. exposure to FDI inflows

[8]We took the difference between 1999 and 1991 and divide by 9 for the subperiod from 1991 to 1999, and we took the difference between 2007 and 1999 and also divide by 9 for the subperiod from 1999 to 2007.

Table 2.1: List of instrumental variables* for the changes in U.S. exposure to international trade in goods and services

Variable	IVs
ΔU.S. exposure to imports from China (ΔIP_{it}^{CZ})	ΔOTH exposure to imports from China (ΔIP_{oit}^{OTH})
ΔU.S. exposure to exports ($\Delta EP_{i,t}^{CZ}$)	ΔOTH exposure to exports (ΔEP_{oit}^{OTH})
ΔU.S. exposure to FDI inflows ($\Delta FDIinf_{i,t}^{CZ}$)	Δpredicted U.S. imports from the world ($\Delta Imports_{i,t}^{PRE}$)
ΔU.S. exposure to FDI outflows ($\Delta FDIout_{i,t}^{CZ}$)	Δpredicted U.S. exports ($\Delta Exports_{i,t}^{PRE}$)

* We borrow the IVs (ΔIP_{oit}^{OTH} and ΔEP_{oit}^{OTH}) developed by Feenstra, Ma, and Xu (2017) to control for the endogeneity of variables measuring U.S. exposure to imports from China and U.S. exposure to exports. The IVs for ΔU.S. exposure to FDI inflows and ΔU.S. exposure to FDI outflows are constructed using the global trade flows data from the UN-Comtrade database, and tariff schedules from the TRAINS and IDB databases.

and FDI outflows. Motivated by Feenstra, Ma, and Xu (2017) method[9], we construct predicted CZ-level U.S. exposure to imports from the world to instrument our CZ-level U.S. exposure to FDI inflows, and we also construct predicted CZ-level U.S. exposure to exports to instrument our CZ-level U.S. exposure to FDI outflows. Table 2.1 lists the instrumental variables for each of the variables measuring U.S. exposure to international trade in goods and services.

Next, we describe the strategy to instrument the changes in U.S. exposure to FDI inflows and FDI outflows represented by expressions (2.5) and (2.6). Essentially, we estimate the predicted value of imports and exports and construct predicted CZ-level U.S. exposure to imports from the world and exports specified in (2.13) and (2.14).

The construction of these IVs requires us to predict U.S. industry-level values of imports and exports to construct the labor-share based averages of U.S. predicted imports from the world and exports along the lines of expressions (2.5) and (2.6). We, therefore, regress the value of bilateral trade at the 6-digit of the HS code, which is obtained from the UN Comtrade, on MFN tariffs at the same product level with various fixed effects using the

[9]As Caliendo et al. (2015) point out, MFN tariff reductions during the Uruguay Round of the GATT/WTO process generated large trade, firm's entry, and welfare effects. Romalis (2007) also finds that NAFTA has a substantial impact on international trade volume using detailed trade and tariff data. Based on these observations, Feenstra, Ma, and Xu (2017) construct the predicted U.S. exports due to the reductions in import tariffs as an instrument for U.S. export expansion.

following specification:

$$lnX_{s,t}^{i,j} = \beta_1 ln(\tau_{s,t}^{i,j}) + \gamma_i + \gamma_j + \gamma_s + \gamma_t + \epsilon_{s,t}, \tag{2.10}$$

where $X_{s,t}^{i,j}$ represents the country i's imports of products s from country j, $\tau_{s,t}^{i,j}$ is import tariff imposed by importer j on exports from country i, γ_i is importer i fixed effects, γ_j is exporter j fixed effects, γ_s is product fixed effects, and γ_t is time fixed effects.

We expect that predicted U.S. imports due to the reductions in tariffs are correlated with U.S. FDI inflows. There are potentially two explanations for this. On the one hand, an increase in imports due to the reductions in tariffs could decrease the amount of FDI inflows into the U.S. if foreign affiliates in the U.S. compete with domestic firms for sales. On the other hand, FDI inflows and imports from the world can have a complementary relationship if foreign affiliates in the U.S. use imported goods to produce their outputs and serve domestic markets. We also expect that predicted U.S. exports are correlated with U.S. FDI outflows. An increase in exports due to the reductions in tariffs could lead to a decrease in U.S. FDI outflows if FDI is led by the desire to replicate activities performed in the home country, i.e., also known as horizontal FDI.[10] This relationship between horizontal FDI outflows and exports is theoretically and empirically shown in Helpman, Melitz, and Yeaple (2004).[11]

Second, we obtain the predicted value of bilateral trade volume based on the estimates in the first step. Third, we select the U.S. as an importing country and then aggregate across the origin of trade to obtain predicted U.S. imports from the world ($\hat{M}_{j,t}$). Similarly, we select the U.S. as an exporting country and then aggregate across other importing countries except the U.S. to obtain predicted U.S. exports ($\hat{X}_{j,t}$). Predicted U.S. imports from the world and predicted U.S. exports are divided by the initial industrial shipments in 1988 to construct predicted import penetration ratio ($\Delta IP_{j,t}^{PRE}$) and export penetration ratio ($\Delta EP_{j,t}^{PRE}$) as

[10] In fact, horizontal FDI and Export-platform FDI account for about 90% of total FDI sales in the BEA FDI sales data during the period from 1991-2007.

[11] They show that when trade frictions are lower or economies of scale are larger, foreign markets are served by exports relative to FDI sales.

follows:

$$\Delta IP_{j,t}^{PRE} = \frac{\hat{M}_{j,t} - \hat{M}_{j,t_0}}{Y_{j,88} + M_{j,88} - X_{j,88}} \tag{2.11}$$

$$\Delta EP_{j,t}^{PRE} = \frac{\hat{X}_{j,t} - \hat{X}_{j,t_0}}{Y_{j,88}} \tag{2.12}$$

The above-mentioned procedure is conducted based on the 6-digit of the HS product-level data. Before constructing instrumental variables for U.S. exposure to FDI inflows and FDI outflows as defined in the specifications of (2.5) and (2.6), we have to convert the specifications (2.11) and (2.12) to 2-digit SIC code because FDI flows are only available 2-digit SIC level, and this is why we need to aggregate the predicted trade values to 2-digit level to construct the instrument for FDI exposures. To do this, we use the crosswalk provided by Pierce and Schott (2009) to convert each 6-digit HS code into one of the 4-digit SIC codes, and then we aggregate the 4-digit SIC codes into 2-digit SIC codes to align the industry code with the BEA FDI sales dataset.

Based on 2-digit SIC level predicted imports and exports due to the reductions in tariffs, we construct predicted CZ-level U.S. exposure to imports from the world ($\Delta FDIinflow_{i,t}^{PRE}$) and predicted CZ-level U.S. exposure to exports ($\Delta FDIoutflow_{i,t}^{PRE}$) as follows:

$$\Delta FDIinflow_{i,t}^{PRE} = \sum_{j} \frac{L_{i,j,88}}{L_{i,88}} \Delta IP_{j,t}^{PRE} \tag{2.13}$$

$$\Delta FDIoutflow_{i,t}^{PRE} = \sum_{j} \frac{L_{i,j,88}}{L_{i,88}} \Delta EP_{j,t}^{PRE}, \tag{2.14}$$

where $L_{i,j,88}$ is CZ i's manufacturing employment in 1988, and $L_{i,88}$ is total employment for commuting zone i in 1988. We use these lagged employment levels to mitigate simultaneous bias as the contemporaneous local labor market employment could be affected by anticipated international trade in goods and services.

As noted above, we borrow the IVs from Feenstra, Ma, and Xu (2017) to control for the endogeneity of U.S. exposure to imports from China and exports described in expressions

(2.7) and (2.8). They are the changes in other eight advanced nations' exposure to imports from China and exports specified in (2.15) and (2.16)[12]:

$$\Delta IP^{OTH}_{o,i,t} = \sum_j \frac{L_{i,j,88}}{L_{i,88}} \Delta IP^{OTH}_{oc,j,t} \tag{2.15}$$

$$\Delta EP^{OTH}_{o,i,t} = \sum_j \frac{L_{i,j,88}}{L_{i,88}} \Delta EP^{OTH}_{j,t}, \tag{2.16}$$

where $\Delta IP^{OTH}_{oc,j,t}$ is computed by dividing the change in other eight high-income countries' imports from China in industry j during the period t by the domestic absorption in 1988. Similarly, $\Delta EP^{OTH}_{j,t}$ is computed by dividing the change in other eight high-income countries' exports to the world except for the United States by the industrial shipment in 1988.

With U.S. exposure to imports from China, exports, FDI inflows, and FDI outflows, and their corresponding instruments, we estimate the main specification (2.9) to test the impact of trade in goods and services on U.S. local labor markets.

2.3 Data

To construct the measures of U.S. exposure to FDI inflows and FDI outflows, we use U.S. multinational foreign affiliate sales as a measure of FDI. We obtain U.S. multinational foreign affiliate sales data from U.S. Direct Investment Abroad and Foreign Direct Investment in the United States datasets provided by the Bureau of Economic Analysis (BEA). The dataset reports the sales of majority-owned foreign affiliates in the U.S. at the industry level based on SIC-based ISI industry classification.[13] We aggregate the industry-level sales of foreign affiliates in the U.S. to compute total FDI inflows from the world. Similarly, the U.S. Direct

[12] Import and export data from Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland are used to construct these instruments.

[13] SIC-based ISI industry classification assigns the 2-digit SIC code to the limited number of industries. The BEA FDI datasets report the sales of foreign affiliates in the U.S. only six manufacturing industries while Feenstra, Ma, and Xu (2017) develop the measures of import and export exposure based on SIC 392 manufacturing industries from the UN-Comtrade Database. This limited number of industries in the BEA datasets may constraint our ability to capture the industry exposure to FDI inflows and FDI outflows at the Communing Zone level. Nonetheless, we use the BEA FDI datasets as there are no other datasets that provide more detailed information about FDI activities inside and outside the U.S.

Investment Abroad dataset reports the sales of U.S. multinationals' foreign affiliates at the industry level based on SIC-based ISI industry classification. We use U.S. majority-owned foreign affiliates' global sales data to construct the measure of U.S. exposure to FDI outflows.

Table 2.2 compares the magnitudes of trade in goods and services in the United States. Table 2.2 shows that U.S. FDI inflows and FDI outflows are already much larger than the value of U.S. imports from China and U.S. exports in 1991. During the periods from 1991 to 2007, U.S. FDI inflows almost doubled and reached US$ 3.34 trillion while U.S. FDI outflows reached US$ 4.74 trillion in 2007. In 2007, the amount of U.S. FDI inflows and FDI outflows were still much larger than U.S. imports from China and U.S. exports.

Table 2.2: Value of U.S. trade in goods and services, 1991-2007 (in billions of 2007 US$)

	Imports from China	U.S. global exports	FDI inflows in U.S.	U.S. FDI outflows
1991	$28.6	$717.9	$1,672.8	$1,752.9
1999	$105.6	$834.0	$2,461.1	$2,671.2
2007	$340.1	$1162.5	$3,340.7	$4,742.6
Growth 1991-2007	1,089.0%	61.9%	99.7%	170.6%

Trade data are reported for the year 1991, 1999, and 2007. Import and export data are obtained from UN-Comtrade. FDI inflow and FDI outflow data are obtained from the Bureau of Economic Analysis. All values are in billion US$, deflated to 2007 US dollars using the PCE price index.

Figures 2.3 and 2.4 show the real value of U.S. FDI inflows and U.S. FDI outflows at the industry level. The transportation equipment industry experienced the largest increase in the value of FDI inflows during 1991-1999, while the machinery industry experienced a decrease in the value of FDI inflows during the same period. For the period from 1999 - 2007, the chemicals industry received the largest amount of FDI inflows, while the electrical equipment industry experienced a substantial decrease in the amount of FDI inflows. Similarly, the machinery industry experienced the largest increase in the value of FDI outflows during 1991-1999, while the electrical equipment industry experienced a decrease in the value of FDI outflows during the same period. For the period from 1999 - 2007, the chemicals industry experienced the largest increase in the value of FDI outflows, while the food industry experienced the smallest increase in the amount of FDI inflows.

These figures show that the expansion of U.S. FDI inflows and U.S. FDI outflows were not evenly distributed across industries. In addition to this uneven FDI activities distribution across industries, each commuting zone has a different initial composition of industry; therefore, different levels of exposure to FDI inflows and FDI outflows. These facts at the industry level and at the CZ level suggest that there exists CZs that are more influenced by FDI activities than other CZs, depending on each CZ's initial exposure to FDI inflows and FDI outflows in specific industries.

Our main specification aims at testing the impact of U.S. exposure to FDI inflows and outflows as well as U.S. exposure to imports from China and exports on U.S. local labor markets. To construct the measures of CZ-level exposure to FDI inflows and FDI outflows specified in (2.5) and (2.6), we use employment information from the Country Business Patterns (CBP) data obtained from U.S. Census Bureau for the years 1991, 1999, and 2007. We follow Acemoglu et al. (2016) to obtain the CBP employment data at the 4-digit SIC industry level and aggregate from the 4-digit of the SIC to the 2-digit of the SIC to align with the industry code in the BEA FDI datasets. We obtain the value of industrial shipments from the NBER-CES Manufacturing Industry Database for the years 1991, 1999, and 2007. These industrial shipment data are concorded from the "whatever-digit of the NAICS" into the 2-digit of the SIC. We borrow the variables for U.S. exposure to imports from China and exports, additional labor market outcomes, and initial demographic and labor force controls from Feenstra, Ma, and Xu (2017).

To estimate the IVs for our measures of U.S. exposure to FDI inflows and FDI outflows, we need to estimate the specification (2.10) using the data on global trade flows and tariffs. We obtain the global trade flows data from the UN-Comtrade database and tariff schedules from the TRAINS and IDB databases, which are accessible via the World Bank's WITS website. Then, we merge the datasets with information on trade flows and tariff values to estimate the predicted bilateral trade flows at the 6-digit of the HS. The IVs for the U.S. exposure to FDI inflows and outflows at the CZ level are constructed using the predicted value for U.S. imports and exports, alongside employment information and industrial shipment data. On the other hand, we borrow the IVs developed by Feenstra, Ma, and Xu (2017) to control for the endogeneity of U.S. exposure to imports and exports of goods. In these cases, the CZ-level U.S. exposure to goods imported from China is instrumented with CZ-level other eight

Figure 2.3: Changes in U.S. Industry Real FDI inflows, 1991-2007 (in millions of 2007 US$)

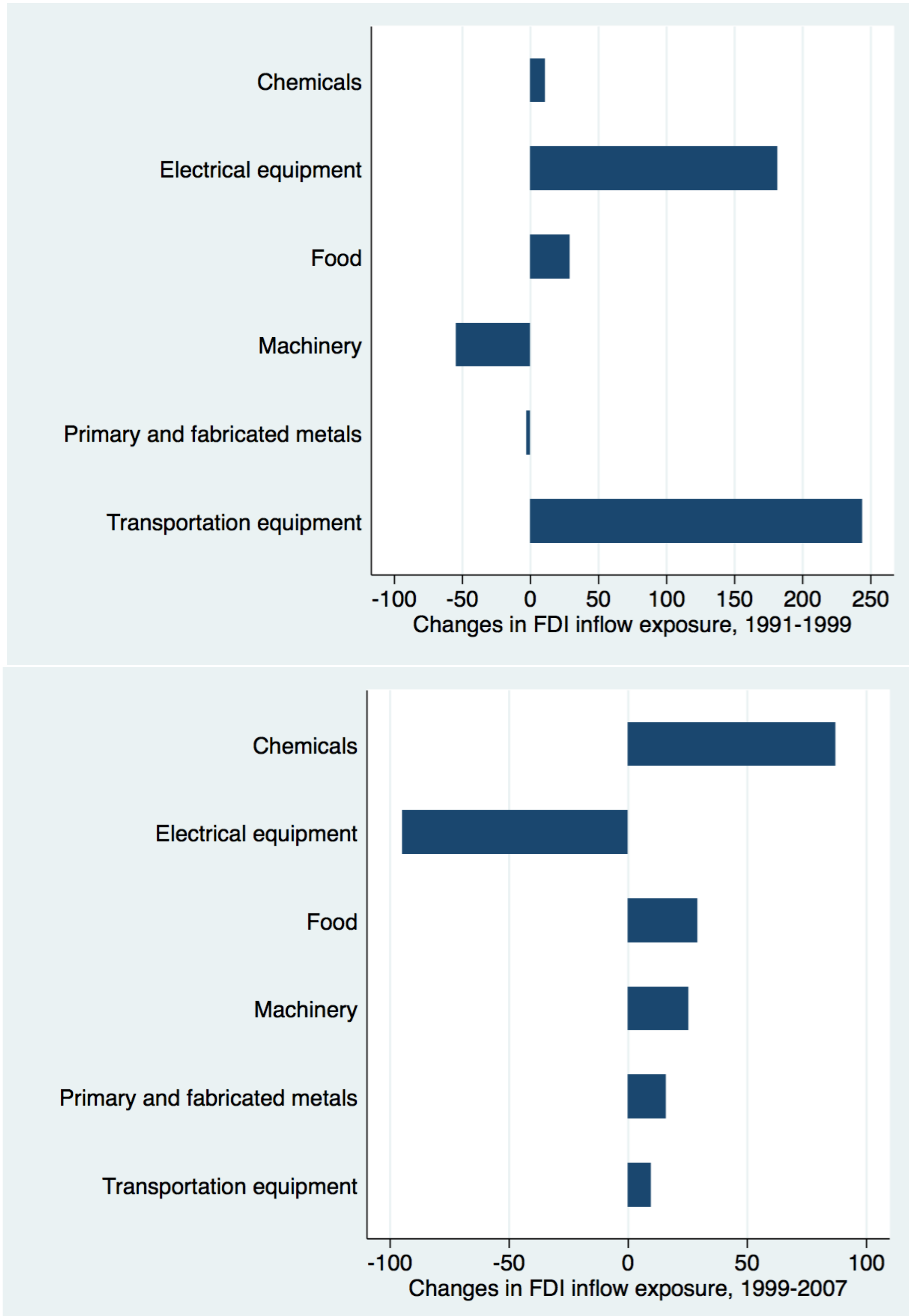
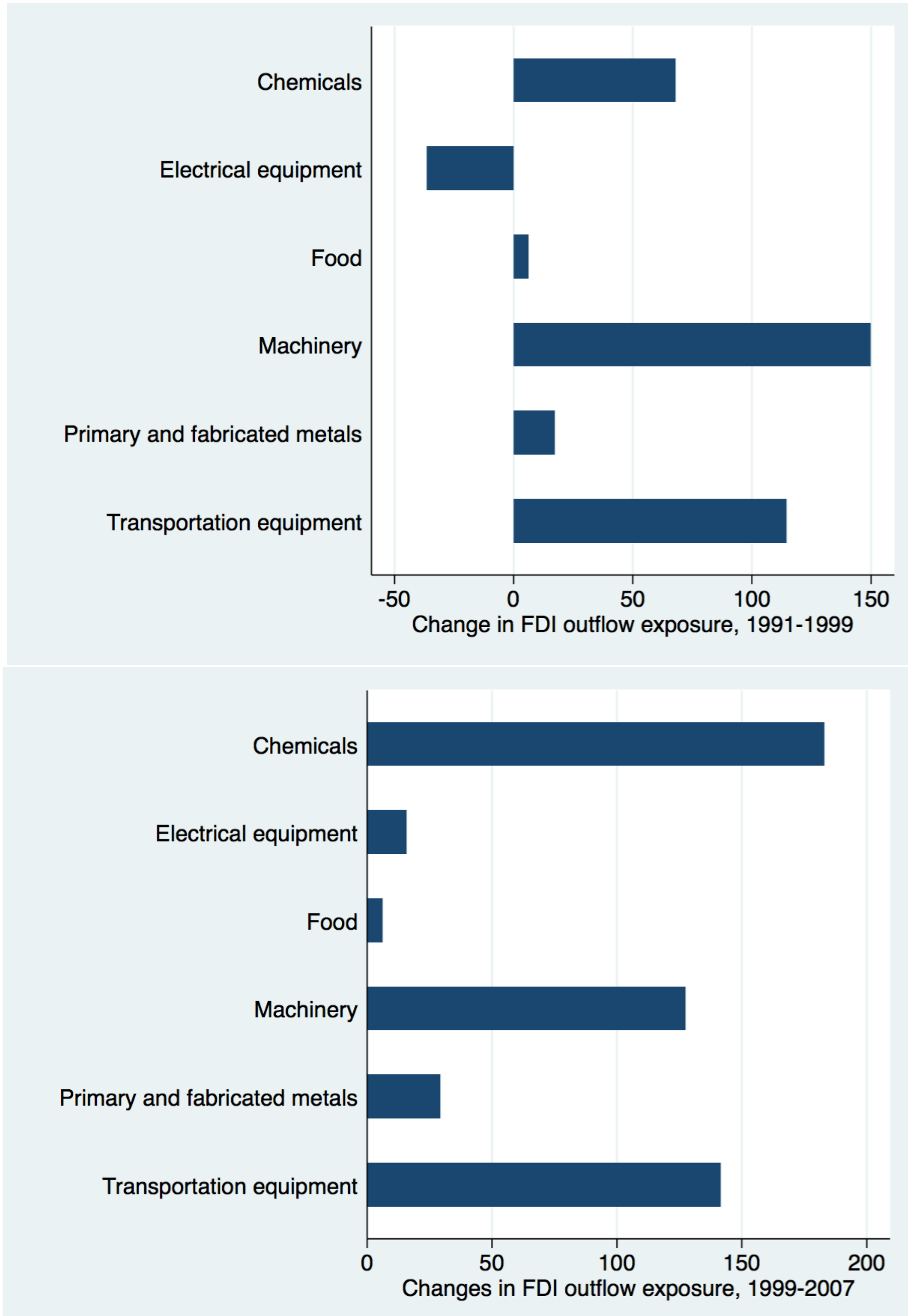


Figure 2.4: Changes in U.S. Industry Real FDI outflow, 1991-2007 (in millions of 2007 US$)



high-income economies exposure to goods imported from China, while the CZ-level exposure to exports of goods is instrumented with the CZ-level other eight high-income economies exposure to exports.

Table 2.3 presents the summary statistics of the CZ-level variables for our main specification (2.9), including the annual change in the share of manufacturing employment, U.S. exposure to trade in goods and services, and the variables related to CZs' start-of-period labor force and demographic composition. The dataset contains 1,444 observations (There are 722 CZs and two time periods from 1991 to 1999 and 1999 to 2007). Table 2.4 presents the summary statistics of CZs' other labor market outcomes such as the population size, manufacturing and nonmanufacturing employment counts, and average log weekly wage. These data are used to investigate the impact of U.S. exposure to international trade in goods and services on other labor market outcomes at the local labor market level. Table 2.4 also provides these details for 722 CZs for the two time periods from 1991 to 1999 and 1999 to 2007.

Table 2.3: Summary statistics for CZ-level variables, 1991-2007

Variable	Unit	Mean	Std. Dev.	Min.	Max.	N
100 × annual Δ in mfg employment share of the working-age population	(% pts)	-0.199	0.22	-1.798	1.495	1444
100 × annual Δ in U.S. exposure to imports from China	(% pts)	0.092	0.079	-0.002	1.018	1444
100 × annual Δ in U.S. exposure to exports to the World	(% pts)	0.141	0.11	-0.348	2.094	1444
100 × annual Δ in U.S. exposure to FDI inflows from the World	(% pts)	0.722	0.653	-1.958	4.353	1444
100 × annual Δ in U.S. exposure to FDI outflows to the World	(% pts)	0.432	0.627	-1.923	3.171	1444
100 × annual Δ in OTH exposure to imports from China	(% pts)	0.086	0.079	-0.059	1.025	1444
100 × annual Δ in OTH exposure to exports to the world	(% pts)	0.169	0.103	-0.356	1.368	1444
100 × annual Δ in predicted imports from the World	(% pts)	1.52	0.433	0	5.059	1444
100 × annual Δ in predicted exports to the World	(% pts)	2.44	0.904	-0.182	7.011	1444
Share of manufacturing employment t-1	(percent)	18.202	8.465	0	61.452	1444
Percent of college-educated t-1	(percent)	50.696	8.238	19.944	70.555	1444
Percent of foreign-born t-1	(percent)	12.308	11.832	0.385	48.908	1444
Percent of employment among women t-1	(percent)	63.995	5.556	33.243	79.606	1444
Percent of employment in routine occupation t-1	(percent)	32.055	2.632	19.992	37.748	1444
Average offshorability index of occupation t-1	(-)	0.045	0.492	-1.636	1.24	1444

Table 2.4: Summary statistics for other dependent variables, 1991-2007

Variable	Unit	Mean	Std. Dev.	Min.	Max.	N
100 × annual Δ in log working-age population counts	(in log pts)	1.161	0.919	-2.637	6.458	1444
100 × annual Δ in log working-age population counts (College)	(in log pts)	2.069	0.951	-2.333	7.522	1444
100 × annual Δ in log working-age population counts (Noncollege)	(in log pts)	0.245	1.11	-3.839	5.621	1444
100 × annual log Δ in manufacturing employment counts	(in log pts)	-1.218	1.658	-9.209	14.511	1444
100 × annual log Δ in nonmanufacturing employment counts	(in log pts)	1.586	0.993	-3.298	6.749	1444
100 × annual log Δ in unemployed working-age population counts	(in log pts)	1.562	2.942	-12.577	11.816	1444
100 × annual log Δ in working-age population not in the labor force	(in log pts)	1.086	1.5	-4.493	7.57	1444
100 × annual Δ in average log weekly wage (All)	(in log pts)	0.765	0.608	-1.063	3.752	1444
100 × annual Δ in average log weekly wage (Males)	(in log pts)	0.551	0.619	-1.588	3.886	1444
100 × annual Δ in average log weekly wage (Females)	(in log pts)	1.141	0.666	-0.868	3.939	1444
100 × annual Δ in average log weekly wage (College)	(in log pts)	0.823	0.601	-1.569	3.739	1444
100 × annual Δ in average log weekly wage (College Male)	(in log pts)	0.743	0.629	-2.695	3.92	1444
100 × annual Δ in average log weekly wage (College Female)	(in log pts)	1.136	0.662	-1.285	3.642	1444
100 × annual Δ in average log weekly wage (Noncollege)	(in log pts)	0.218	0.682	-1.803	2.59	1444
100 × annual Δ in average log weekly wage (Noncollege Male)	(in log pts)	-0.008	0.716	-2.223	3.171	1444
100 × annual Δ in average log weekly wage (Noncollege Female)	(in log pts)	0.434	0.747	-1.725	3.244	1444
100 × annual log Δ in number of mfg employment (College)	(in log pts)	-0.114	1.9	-12.126	13.291	1444
100 × annual log Δ in number of mfg employment (Noncollege)	(in log pts)	-2.225	1.953	-16.449	15.556	1444
100 × annual log Δ in number of nonmfg employment (College)	(in log pts)	2.228	0.983	-2.341	8.801	1444
100 × annual log Δ in number of nonmfg employment (Noncollege)	(in log pts)	0.701	1.399	-4.22	6.533	1444
100 × annual Δ in average log weekly mfg wage	(in log pts)	0.964	0.728	-4.594	4.934	1444
100 × annual Δ in average log weekly mfg wage (College)	(in log pts)	1.122	0.752	-3.748	7.486	1444
100 × annual Δ in average log weekly mfg wage (Noncollege)	(in log pts)	0.252	0.768	-5.358	5.958	1444
100 × annual Δ in average log weekly nonmfg wage	(in log pts)	0.802	0.617	-1.099	3.658	1444
100 × annual Δ in average log weekly nonmfg wage (College)	(in log pts)	0.846	0.608	-1.668	3.563	1444
100 × annual Δ in average log weekly nonmfg wage (Noncollege)	(in log pts)	0.307	0.682	-1.697	2.727	1444
100 × Δ in annual avg. household income	(% pts)	0.905	1.191	-2.21	7.557	1444
100 × Δ in annual avg. household wage and salary	(% pts)	1.184	0.993	-2.078	6.367	1444
100 × Δ in annual avg. household business and investment income	(% pts)	-0.381	2.916	-6.885	11.921	1444
100 × Δ in annual median household income	(% pts)	0.553	1.037	-2.56	6.886	1444
100 × Δ in annual median household wage and salary	(% pts)	0.408	1.237	-2.941	10.999	1444

2.4 Main Empirical results

Table 2.5 reports the net effect of trade in goods (i.e., U.S. exposure to imports from China and exports) and trade in services (i.e., U.S. exposure to FDI inflows and FDI outflows) on U.S. manufacturing employment share. As for trade in goods, CZ-level U.S. exposure to imports from China and exports are instrumented with the CZ-level other eight high-income economies exposure to imports from China and exports, respectively. As for trade in services, CZ-level U.S. exposure to FDI inflows and FDI outflows are instrumented with predicted CZ-level U.S. exposure to imports from the world and exports, respectively. As explained below, we find that the change in U.S. exposure to trade in goods and to FDI flows has led to a net benefit in terms of the share of manufacturing employment.[14] The results show that the net effect of international trade exposure on local manufacturing employment share was slightly positive during the periods from 1991 to 2007.

To understand this result, we move in steps by trying to qualitatively obtain/reproduce the results based on U.S. exposure to trade in goods, and later by adding U.S. exposure to FDI flows. Column (1) of Table 2.5 shows that the average increase in U.S. exposure to imports from China is associated with a 0.150 ($= 0.092 \times -1.630$) percentage point decrease in the share of manufacturing employment across local labor markets.[15] Column (2) reports the effects of U.S. exposure to imports from China and exports. While the import exposure continues to reduce the share of local manufacturing employment, the export exposure partially cancels out this negative employment effect by increasing the share of local manufacturing employment. The average increase in import exposure is associated with a 0.129 ($= 0.092 \times -1.406$) percentage point decrease in the share of local manufacturing employment. In contrast, the average increase in export exposure is associated with a 0.071 ($= 0.141 \times 0.504$) percentage point increase in the share of local manufacturing employment. The average increase in U.S. exposure to trade in goods, therefore, is associated with a 0.058

[14] We use all of four instrumental variables in all of the 2SLS regressions in Table 2.5. The first stage results in columns (1) - (4) are, therefore, the same as the ones in column (5).

[15] All of the columns in Table 2.5 control for the start of the period commuting zone's demographic characteristics and census division dummies.

percentage point decrease in the manufacturing employment share. This result is very significant as it explains about 29 percent of the average decline among U.S. local labor markets during the periods from 1991 to 2007.

Column (3) also considers U.S. exposure to FDI inflows in addition to U.S. exposure to imports from China and exports. The results show that the change in U.S. exposure to FDI inflows increases the local manufacturing employment share, while import exposure continues to reduce the local manufacturing employment share. The coefficient of export exposure is positive but statistically insignificant. Column (4) considers U.S. exposure to FDI outflows instead of the change in U.S. exposure to FDI inflows. The results show that U.S. exposure to FDI outflows reduces the manufacturing employment share, while import and export exposure has negative and positive effects on the local manufacturing employment share, respectively.

Column (5) considers the exposure to international trade in goods and services and, therefore, it represents our baseline specification. Panel B of Table 2.5 reports average annualized changes in U.S. exposure to international trade in goods and services based on the estimated coefficients shown in column (5) of Table 2.5. In terms of U.S. exposure to international trade in goods, panel B shows that the average increase in U.S. exposure to imports from China is associated with an 0.089 percentage point decrease in the share of manufacturing employment, while the average increase in U.S. exposure to exports is associated with an 0.079 percentage point increase in the share of manufacturing employment. In terms of U.S. exposure to international trade in services, panel B shows that the average increase in U.S. exposure to FDI inflows is associated with an 0.108 percentage point increase in the share of manufacturing employment, while the average increase in U.S. exposure to FDI outflows is associated with a 0.049 percentage point decrease in the share of manufacturing employment. Panel C of Table 2.5 reports the first stage results for the column (5). The results show that the changes in other developed nations' exposure to imports from China and exports are positively correlated with U.S. exposure to imports from China and exports, respectively. On the other hand, the changes in U.S. exposure to predicted imports and exports are negatively correlated with U.S. exposure to FDI inflows and FDI outflows, respectively.

Column (5) confirms that U.S. exposure to imports and FDI outflows has adverse effects on local manufacturing employment share, while U.S. exposure to exports and FDI inflows has positive effects on local manufacturing employment share. The coefficients of all measures of U.S. exposure have the expected signs and are statistically significant. In Panel B, we find that the net effect of exposure in goods equal to -0.01 percentage points, being outweighed by the net effect of exposure in services, which equals +0.059. This shows that the net effect of international trade exposure was slightly positive from 1991 to 2007. The average increase in U.S. exposure to international trade in goods and services is associated with a 0.049 percentage point increase in the share of local manufacturing employment. The estimates in Table 2.5, therefore, provide evidence that exposure to imports and FDI outflows reduce the manufacturing employment share across local labor markets while exposure to exports and FDI inflows increase the manufacturing employment share.

Table 2.5: 2SLS estimates (1991 - 2007)[a]

Panel A: Dependent variable: 100 × Δ in manufacturing / employment share	(1)	(2)	(3)	(4)	(5)
Δ Imports from China	-1.630***	-1.406***	-1.231***	-1.317***	-0.966***
	(0.205)	(0.212)	(0.206)	(0.216)	(0.230)
Δ Exports to the World		0.504*	0.186	0.750**	0.558*
		(0.269)	(0.312)	(0.313)	(0.324)
Δ FDI inflows from the World			0.103***		0.149***
			(0.038)		(0.043)
Δ FDI outflows to the World				-0.054**	-0.114***
				(0.027)	(0.031)

Panel B: The effects of exposure to International Trade in Goods and Services (based on Column 5 in Panel A)

Avg. Annualized Δ U.S. exposure to Imports from China (%pts) 0.092 × -0.966 = -0.089

Avg. Annualized Δ U.S. exposure to Exports (%pts) 0.141 × 0.558 = 0.079

Avg. Annualized Δ U.S. exposure to FDI inflows (%pts) 0.722 × 0.149 = 0.108

Avg. Annualized Δ U.S. exposure to FDI outflows(%pts) 0.432 × -0.114 = -0.049

Net Effects (%pts) **0.049**

Panel C: 2SLS First stage estimates of Column 6 in Panel A

variables	Δ imports	Δ Exports	Δ FDI inflows	Δ FDI outflows
Δ imports from China to OTH	0.661***	-0.232**	-0.947	0.549***
	(0.053)	(0.114)	(0.641)	(0.230)
Δ OTH exports to the World	-0.007	0.323***	0.639*	-0.865***
	(0.029)	(0.067)	(0.333)	(0.151)
Δ predicted imports from the World	-0.003	-0.007	-0.695***	0.258***
	(0.006)	(0.014)	(0.117)	(0.051)
Δ predicted exports to the World	0.002	-0.020***	-0.138***	-0.389***
	(0.003)	(0.004)	(0.027)	(0.019)

[a] N = 1,444 (722 CZs × two time periods). All regressions include Census division dummies and the full vector of start-of-period control variables. Standard errors in parentheses are clustered on commuting zone. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively.

To quantify our results in Table 2.5 above, we use the method introduced in Acemoglu et al. (2016). We express the changes in employment induced by CZ's exposure to international trade in goods and services as:

$$\Delta L_t = \sum_i \left[L_{i,t}^{CZ} \left(1 - e^{-\left(\widehat{\Delta IP_{i,t}^{CZ}} + \widehat{\Delta EP_{i,t}^{CZ}} + \Delta F\widehat{DIinf_{i,t}^{CZ}} + \Delta F\widehat{DIout_{i,t}^{CZ}}\right)} \right) \right], \tag{2.17}$$

where $\widehat{\Delta IP_{i,t}^{CZ}} \equiv \hat{\beta}_1 \Delta IP_{i,t}^{CZ}$, $\widehat{\Delta EP_{i,t}^{CZ}} \equiv \hat{\beta}_2 \Delta EP_{i,t}^{CZ}$, $\Delta F\widehat{DIinf_{i,t}^{CZ}} \equiv \hat{\beta}_3 \Delta FDIinf_{i,t}^{CZ}$, and $\Delta F\widehat{DIout_{i,t}^{CZ}} \equiv \hat{\beta}_4 \Delta FDIout_{i,t}^{CZ}$ are the estimated import, export, FDI inflow, and FDI outflow effects from column (5) in Table 2.5. Hypothetically, this equation calculates the difference between the actual and counterfactual manufacturing employment in year t if there were no changes in U.S. exposure to international trade in goods and services.

Applying the second-order approximation $e^x - 1 \approx x + x^2/2$ for $x = \widehat{\Delta IP_{i,t}^{CZ}} + \widehat{\Delta EP_{i,t}^{CZ}} + \Delta F\widehat{DIinf_{i,t}^{CZ}} + \Delta F\widehat{DIout_{i,t}^{CZ}}$ in equation (2.17), we obtain:

$$\begin{aligned} &\sum_i \left[L_{i,t}^{CZ} \left(1 - e^{-\left(\widehat{\Delta IP_{i,t}^{CZ}} + \widehat{\Delta EP_{i,t}^{CZ}} + \Delta F\widehat{DIinf_{i,t}^{CZ}} + \Delta F\widehat{DIout_{i,t}^{CZ}}\right)} \right) \right] \\ &\approx \sum_i \left[L_{i,t}^{CZ} \left(1 - e^{-\widehat{\Delta IP_{i,t}^{CZ}}} \right) + \left(1 - e^{-\widehat{\Delta EP_{i,t}^{CZ}}} \right) + \left(1 - e^{-\Delta F\widehat{DIinf_{i,t}^{CZ}}} \right) + \left(1 - e^{-\Delta F\widehat{DIout_{i,t}^{CZ}}} \right) - C_{it} \right]. \end{aligned} \tag{2.18}$$

We interpret the first four terms on the right-hand side of this equation as a decomposition of the total employment impact into that due to imports, exports, FDI inflows, and FDI outflows. C_{it}[16] is a weighted cross-moment of the import, export, FDI inflow, and FDI outflow effects when multiplied by L_{it}^{CZ} and summed across commuting zones.[17]

Panels A and B of Table 2.6 provide the implied employment changes from Acemoglu et al. (2016) and Feenstra et al. (2017), respectively. Panel C of Table 2.6 summarizes the implied employment changes induced by U.S. exposure to international trade in goods and

[16] $C_{it} = \widehat{\Delta IP_{i,t}^{CZ}}\widehat{\Delta EP_{i,t}^{CZ}} + \Delta F\widehat{DIinf_{i,t}^{CZ}}\Delta F\widehat{DIout_{i,t}^{CZ}} + \widehat{\Delta IP_{i,t}^{CZ}}\Delta F\widehat{DIinf_{i,t}^{CZ}} + \widehat{\Delta IP_{i,t}^{CZ}}\Delta F\widehat{DIout_{i,t}^{CZ}} + \widehat{\Delta EP_{i,t}^{CZ}}\Delta F\widehat{DIinf_{i,t}^{CZ}} + \widehat{\Delta EP_{i,t}^{CZ}}\Delta F\widehat{DIout_{i,t}^{CZ}}$

[17] If this weighted cross-moment is negative, then the combined effect measured by the left-hand side of this equation will be greater than the sum of import, export, FDI inflow, and FDI outflow effects on the right.

services.

Our implied employment changes due to U.S. exposure to imports from China and exports are in line with the implied employment changes calculated by Acemoglu et al. (2016) and Feenstra et al. (2017). Furthermore, considering the implied employment changes due to U.S. exposure to FDI inflows and FDI outflows, we find that the net implied employment changes during the period from 1991 to 2007 was 1.36 million.

Table 2.6: Implied Employment Changes Induced by the increase in Exposure to International Trade [a]

Implied Employment Changes (in millions)			
	1991-99	1999-2007	1991-2007
Panel A: Acemoglu et al. (2016)			
Δ Imports from China	-0.74	-2.29	-3.03
Net Changes	-0.74	-2.29	**-3.03**
Panel B: Feenstra et al. (2017)			
Δ Imports from China	-0.97	-2.58	-3.55
Δ Exports to the World	2.01	1.34	3.35
Net Changes	1.04	-1.24	**-0.20**
Panel C: Our paper			
Δ Imports from China	-0.76	-2.01	-2.77
Δ Exports to the World	1.42	0.95	2.37
Δ FDI inflows from the World	1.61	1.70	3.31
Δ FDI outflows to the World	0.03	-1.58	-1.55
Net Changes	2.3	-0.94	**1.36**

Tables 2.5 and 2.6 provide evidence that U.S. exposure to international trade in goods and services, on average, increases the share of manufacturing employment at the local labor market level. Next, we investigate the impact of international trade exposure on other

local labor market characteristics, including the population size, the number of unemployed workers, and the average wage in manufacturing and non-manufacturing sectors. Table 2.7 reports the effects of international trade shocks on the working-age population size. The results show that U.S. exposure to international trade in goods and services does not significantly influence the working-age population size in CZs except for the negative effect of U.S. exposure to FDI outflows on the college-educated population. As ADH (2013) suggest, there are three possible explanations for this lack of working-age population mobility despite international trade shocks. One possibility is that these shocks are simply too small to affect local labor markets. The second possibility is that goods markets are nationally integrated well enough so that local labor markets can adjust to these international trade shocks without the mobility response. The third possibility is that people tend to stay at the same local labor market because moving to other labor markets is costly, and also other factors may provide people incentives to stay at the same local labor market after international trade shocks. It is, however, not very clear why we observe these non-significant effects of international trade shocks on population size only from the results in Table 2.7.

Table 2.8 examines the effects of U.S. exposure to international trade in goods and services on the four exhaustive and mutually exclusive categories that form the working-age population of each local labor market, namely: the number of manufacturing employment, the number of nonmanufacturing employment, the number of unemployment, and the number of labor force nonparticipation (NILF).

In the first row of Table 2.8, we find that the average increase in exposure to imports from China is associated with a 0.43 log point decrease in the number of manufacturing employment. The second row of Table 2.8 reports the employment effect of export exposure, and we find that export exposure does not affect population counts in CZs. The third row of Table 2.8 reports the employment effect of U.S. exposure to FDI inflows. We find that the average increase in U.S. exposure to FDI inflows is associated with a 0.51 log point increase in manufacturing employment counts. This positive employment effect of FDI inflow exposure is reflected by the corresponding decreases in the number of unemployment and labor force nonparticipation. The average increase in U.S. exposure to FDI inflows is associated with

Table 2.7: 2SLS estimates for annualized changes in log population counts (in log pts)(1991 - 2007) [a]

Dependent variable: Annualized changes in log population counts			
	(1) All	(2) College	(3) Noncollege
Δ Imports from China	0.700	0.718	1.415
	(1.380)	(1.189)	(1.523)
Δ Exports to the World	0.018	0.106	1.190
	(0.863)	(0.951)	(1.145)
Δ FDI inflows from the World	0.076	-0.028	0.180
	(0.174)	(0.185)	(0.196)
Δ FDI outflows to the World	-0.155	-0.264**	-0.166
	(0.132)	(0.126)	(0.161)
Start of the period CZ's characteristics	Yes	Yes	Yes
Census division dummies	Yes	Yes	Yes
Observations	1444	1444	1444

[a] N = 1,444 (722 CZs × two time periods). All regressions include Census division dummies and the full vector of start-of-period control variables. Standard errors in parentheses are clustered on commuting zone. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively.

a 1.38 log point and a 0.38 log point reduction in the number of unemployed workers and labor force nonparticipation, respectively.

Similarly, the fourth row of Table 2.8 reports the employment effect of U.S. exposure to FDI outflows. We find that U.S. exposure to FDI outflows reduces nonmanufacturing employment counts, while the effect of U.S. exposure to FDI outflows on manufacturing employment is not statistically significant. The average increase in U.S. exposure to FDI outflows is associated with a 0.17 log point decrease in the number of nonmanufacturing employment, while the average increase in U.S. exposure to FDI outflows is associated with a 0.53 log point increase in the number of unemployed workers.

These results in Table 2.8 with the results in Table 2.7 suggest that the non-significant effects of international trade on population size come from the lack of labor mobility across CZs. People do not depart from their CZ after international trade shocks because moving is costly, and also the positive effect of U.S. exposure to FDI inflows outweighs the negative effects of U.S. exposure to imports from China and FDI outflows, and this induces people to stay at the same CZ. Other factors may also provide people incentives to stay at the same local labor market after international trade shocks.

In Table 2.9, we analyze the effects of U.S. exposure to international trade in goods and services on the mean log weekly wage across CZs. Panel A reports the wage effects of exposure to international trade in goods and services at all educational levels. Panel B reports the wage effects of international trade exposure on college-educated workers, while panel C reports the effects of international trade exposure on non-college workers. Each panel also reports the wage effects of U.S. exposure to international trade in goods and services on male and female workers.

Column (1) in panel A finds that U.S. exposure to imports from China and exports do not significantly affect the wage of all workers. In contrast, U.S. exposure to FDI inflows increases the mean log weekly wage, and U.S. exposure to FDI outflows reduces the wage at all educational levels. The average increase in U.S. exposure to FDI inflows is associated with a 0.27 log point increase in the mean log weekly wage, while U.S. exposure to FDI outflows is associated with a 0.13 log point decrease in the mean log weekly wage. This shows that

Table 2.8: 2SLS estimates for annualized changes in log population counts by employment status (in log pts) (1991 - 2007) [a]

Dependent variable: Annualized changes in log population counts by employment status				
	(1)	(2)	(3)	(4)
	Mfg emp	Non-mfg emp	Unemp	NILF
Δ Imports from China	-4.709***	1.412	5.775	1.685
	(1.791)	(1.216)	(3.857)	(2.549)
Δ Exports to the World	2.660	-0.725	2.319	-1.265
	(2.280)	(1.209)	(5.718)	(1.672)
Δ FDI inflows from the World	0.700**	0.298	-1.911***	-0.530*
	(0.357)	(0.212)	(0.702)	(0.276)
Δ FDI outflows to the World	-0.208	-0.391***	1.224**	0.298
	(0.263)	(0.145)	(0.484)	(0.267)
Start of the period CZ's characteristics	Yes	Yes	Yes	Yes
Census division dummies	Yes	Yes	Yes	Yes
Observations	1444	1444	1444	1444

[a] N = 1,444 (722 CZs × two time periods). All regressions include Census division dummies and the full vector of start-of-period control variables. Standard errors in parentheses are clustered on commuting zone. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively.

the net wage effects of U.S. exposure to international trade in services are positive, and the average increase in U.S. exposure to FDI inflows and FDI outflows increases the mean log weekly wage by 0.14 log points.

Similarly, the results in column (1) of Panel B and Panel C report the wage effects of U.S. exposure to international trade in goods and services on college-educated and non-college workers, respectively. The results are similar to the ones in column (1) of panel A. Import and export exposure do not significantly affect the wage of both college-educated and non-college workers. In contrast, the average increase in U.S. exposure to FDI inflows and FDI outflows increases the mean log weekly wage by 0.173 and 0.178 log points for college-educated workers and non-college workers at all educational levels, respectively.

Columns (2) and (3) of Table 2.9 additionally examines the differential effects of exposure to international trade in goods and services on male workers and female workers, respectively. Panel A shows that the net wage effects of U.S. exposure to international trade in services are positive for both college-educated male and female workers. The average increase in U.S. exposure to FDI inflows and FDI outflows is associated with a 0.157 log point increase in the mean log weekly wage of male workers, while the average increase in U.S. exposure to FDI inflows and FDI outflows is associated with a 0.070 log point increase in the mean log weekly wage of female workers at all educational levels.

Similarly, panel B shows that the average increase in U.S. exposure to FDI inflows and FDI outflows is associated with a 0.169 increase in the mean log weekly wage of college-educated male workers. In comparison, the average increase in U.S. exposure to FDI inflows and FDI outflows is associated with a 0.148 increase in the mean log weekly wage of college-educated female workers. Furthermore, the results in panel C show that the average increase in U.S. exposure to FDI inflows and FDI outflows is associated with a 0.233 increase in the mean log weekly wage of non-college male workers, while the average increase in U.S. exposure to FDI inflows and FDI outflows is associated with a 0.069 increase in the mean log weekly wage of non-college female workers. Overall, the results in column (2) and (3) suggest that the net wage effects of U.S. exposure to FDI inflows and outflows are larger for male workers than for female workers regardless of education level.

In sum, Table 2.9 finds that the non-significant wage effects from U.S. exposure to imports from China and exports, while U.S. exposure to FDI inflows and outflows significantly affects the mean log weekly wage regardless of educational levels and gender. U.S. exposure to FDI inflows tends to increase the mean log weekly wage of the working-age population, while U.S. exposure to FDI outflows tends to lower the mean log weekly wage of the working-age population.

Table 2.9: 2SLS estimates for changes in avg. log weekly wage (in log pts) (1991 - 2007)

Dependent variable: Annualized changes in avg. log weekly wage

	(1) Wage (All)	(2) Wage (Males)	(3) Wage (Females)
Panel A: All education levels			
Δ Imports from China	0.170	0.197	-0.017
	(0.730)	(0.842)	(0.657)
Δ Exports to the World	-0.188	0.077	-0.249
	(0.991)	(1.062)	(0.823)
Δ FDI inflows from the World	0.369***	0.414***	0.241**
	(0.111)	(0.120)	(0.094)
Δ FDI outflows to the World	-0.308***	-0.329***	-0.241***
	(0.088)	(0.104)	(0.077)
Panel B: College education			
Δ Imports from China	0.156	-0.108	0.262
	(0.725)	(0.881)	(0.650)
Δ Exports to the World	-0.553	-0.178	-0.689
	(1.013)	(1.077)	(0.884)
Δ FDI inflows from the World	0.407***	0.411***	0.355***
	(0.113)	(0.121)	(0.102)
Δ FDI outflows to the World	-0.279***	-0.296***	-0.251***
	(0.091)	(0.107)	(0.082)
Panel C: No college education			
Δ Imports from China	0.334	0.846	-0.628
	(0.912)	(1.002)	(0.891)
Δ Exports to the World	0.208	0.266	0.459
	(1.218)	(1.363)	(0.955)
Δ FDI inflows from the World	0.424***	0.521***	0.210*
	(0.139)	(0.154)	(0.122)
Δ FDI outflows to the World	-0.296***	-0.332***	-0.191*
	(0.102)	(0.115)	(0.101)
Start of the period CZ's characteristics	Yes	Yes	Yes
Census division dummies	Yes	Yes	Yes
Observations	1444	1444	1444

[a] N = 1,444 (722 CZs × two time periods). All regressions include Census division dummies and the full vector of start-of-period control variables. Standard errors in parentheses are clustered on commuting zone. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively.

Panel B in Table 2.10 explores wage effects separately for workers employed in the manufacturing and non-manufacturing sectors. To aid interpretation, Panel A reports the effects of exposure to international trade in goods and services on log employment counts in both manufacturing and non-manufacturing sectors. Panel A finds that import exposure reduces the number of manufacturing workers, especially non-college workers. Panel B finds that import exposure increases the mean log weekly wage for college and non-college manufacturing workers. For non-manufacturing workers, import exposure has little effect on both the number of workers and the mean log weekly wage at all educational levels, except for college-educated non-manufacturing workers in column (5) of Panel A. One explanation for this pattern in the manufacturing sector is that workers with the least skills tend to be displaced due to import competition, and the most productive workers retain their jobs. As a result, those workers who remain in the labor market experience an increase in the mean log weekly wage.

The second row in Panel A reports the non-significant effects of export exposure on the number of manufacturing and non-manufacturing workers, while the second row in panel B finds that workers in the manufacturing sector experience an increase in the mean log weekly wage. We find a significant and positive effect of export exposure on the mean log weekly wage in the manufacturing sector for college-educated workers, but we do not find any significant effects in the non-manufacturing sector at all educational levels. The combination of both results suggest that trade in goods benefits college-degree holders as their wages grow and their employment numbers are not affected.

In the third row in Panel A of Table 2.10, we find that U.S. exposure to FDI inflows increases the number of college-educated manufacturing workers, and it also increases the number of non-manufacturing workers without college degrees. In the third row in panel B of Table 2.10, we find that U.S. exposure to FDI inflows increases the mean log weekly wage of non-college manufacturing workers, while it increases the mean log weekly wage for non-manufacturing workers at all educational levels.

The fourth row in Panel A of Table 2.10 finds that U.S. exposure to FDI outflows reduces the number of college-educated workers in the manufacturing sector, and it also reduces the number of workers in the non-manufacturing sector at all educational levels. As Becker et al. (2005) suggest, affiliate employment tends to substitute for employment at the parent firm. They find that FDI outflows from Germany into Western Europe has the most substantial employment substitutability effect. Our results are consistent with Becker et al. (2005) finding that U.S. foreign affiliates in Europe and elsewhere substitute domestic employment in the U.S. for foreign employment. Also, in the fourth row in panel B of Table 2.10, we find that U.S. exposure to FDI outflows reduces the overall wage and wage of non-college workers in the manufacturing sector. It also reduces the overall wage and wage of college-educated non-manufacturing workers.

Table 2.10: Annualized Employment and Wage changes in Manufacturing and Non Manufacturing (1991 - 2007)

	Manufacturing sector			Non manufacturing sector		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Log change in number of workers	All	College	Non college	All	College	Non college
Δ Imports from China	-4.709***	-2.515	-5.916***	1.412	1.854*	1.582
	(1.791)	(2.020)	(2.078)	(1.216)	(1.124)	(1.444)
Δ Exports to the World	2.660	2.369	4.337	-0.725	0.507	-0.830
	(2.280)	(2.431)	(2.723)	(1.209)	(1.098)	(1.719)
Δ FDI inflows from the World	0.700**	0.761**	0.526	0.298	0.006	0.700***
	(0.357)	(0.388)	(0.411)	(0.212)	(0.205)	(0.264)
Δ FDI outflows to the World	-0.208	-0.739**	-0.095	-0.391***	-0.323**	-0.579***
	(0.263)	(0.302)	(0.330)	(0.145)	(0.140)	(0.190)
	Manufacturing sector			Non manufacturing sector		
Panel B: Log change in avg. log wage	All	College	Non college	All	College	Non college
Δ Imports from China	3.073**	2.900***	2.134*	-0.473	-0.284	-0.293
	(1.345)	(0.962)	(1.295)	(0.760)	(0.748)	(0.922)
Δ Exports to the World	2.190**	2.116**	1.284	-0.461	-0.884	0.057
	(0.976)	(0.979)	(1.127)	(0.942)	(0.974)	(1.161)
Δ FDI inflows from the World	0.264	0.055	0.338**	0.336***	0.404***	0.345**
	(0.176)	(0.140)	(0.161)	(0.104)	(0.108)	(0.135)
Δ FDI outflows to the World	-0.422***	-0.180	-0.408***	-0.191**	-0.221**	-0.142
	(0.157)	(0.120)	(0.137)	(0.087)	(0.093)	(0.099)
Start of the period CZ's characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Census division dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1444	1444	1444	1444	1444	1444

[a] N = 1,444 (722 CZs × two time periods). All regressions include Census division dummies and the full vector of start-of-period control variables. Standard errors in parentheses are clustered on commuting zone. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively.

International trade shocks may also have an impact on household income due to the combinations of employment effects and wage effects in CZs. Column (1) of Table 2.11 reports the effects of U.S. exposure to international trade in goods and services on average and median household income.[18] The results in column (1) show that U.S. exposure to imports and exports do not significantly affect average household income. In contrast, the average increase in U.S. exposure to FDI inflows is associated with a 0.50 percentage point increase in average household income, while the average increase in U.S. exposure to FDI outflows is associated with a 0.21 percentage point reduction in average household income. The results in column (1), therefore, shows that the average increase in U.S. exposure to international trade in services is associated with a 0.29 percentage point increase in average household income.

Columns (2) and (3) examine the effects of U.S. exposure to FDI inflows on wage and social security transfer receipts. The results in both columns suggest that import and export exposure do not significantly affect the wage and social security transfer receipts. On the other hand, we find that FDI inflow and outflow exposure significantly affect the average household wage income. The average increase in U.S. exposure to FDI inflows is associated with a 0.55 percentage point increase in wage income, while the average increase in U.S. exposure to FDI outflows is associated with a 0.27 percentage point decrease in wage income. Thus, the results in column (2) show that the average increase in U.S. exposure to international trade in services is associated with a 0.28 percentage point increase in average household wage income. Similarly, the average increase in U.S. exposure to FDI inflows is associated with a 0.55 percentage point decrease in social security transfer receipts. In contrast, the average increase in U.S. exposure to FDI outflows does not significantly affect the social security transfer receipts. The results in column (3) show that average household social security receipts decrease due to U.S. exposure to international trade in services.

Columns (4) and (5) additionally investigates the effects of U.S. exposure to international

[18]The average household income is defined as the sum of individual incomes of all working-age (age 16-64) household members, divided by the number of household members of that age group. Total income comprises wage and salary income, self-employment, business, and investment income, social security and welfare income, and income from other nonspecified sources.

trade in goods and services on the median household income and wage. The results in column (4) suggest that the average increase in U.S. exposure to FDI inflows is associated with a 0.46 percentage point increase in median household income, while the average increase in U.S. exposure to FDI outflows is associated with a 0.22 percentage point decrease in median household income. Therefore, the median household income increases by 0.24 percentage points due to the average increase in U.S. exposure to international trade in services. Similarly, the results in column (5) suggest that the average increase in U.S. exposure to FDI inflows is associated with a 0.54 percentage point increase in median household wage, while the average increase in U.S. exposure to FDI outflows is associated with a 0.23 percentage point decrease in median household wage. Therefore, median household wage increases by 0.31 percentage point due to the average increase in U.S. exposure to international trade in services. These results in columns (4) and (5) are consistent with the findings in columns (1) and (2) and confirm the positive net effects of U.S. exposure to international trade in services on household income and wage.

Table 2.11: Annualized percentage change in average and median annual household income per working-age adult (1991 - 2007)

	(1) Total	(2) Wage	(3) SocSec	(4) Median-Total	(5) Median-Wage
Δ Imports from China	-0.646	-0.982	0.541	0.782	-0.589
	(1.048)	(1.463)	(1.538)	(1.339)	(1.446)
Δ Exports to the World	-1.595	-0.159	2.578	-0.630	-0.555
	(1.806)	(1.892)	(2.468)	(1.798)	(2.150)
Δ FDI inflows from the World	0.699***	0.758***	-0.767**	0.636***	0.746***
	(0.208)	(0.247)	(0.312)	(0.219)	(0.263)
Δ FDI outflows to the World	-0.483***	-0.616***	0.179	-0.516***	-0.531***
	(0.152)	(0.197)	(0.214)	(0.170)	(0.197)
Start of the period CZ's characteristics	Yes	Yes	Yes	Yes	Yes
Census division dummies	Yes	Yes	Yes	Yes	Yes
Observations	1444	1444	1444	1444	1444

[a] N = 1,444 (722 CZs × two time periods). All regressions include Census division dummies and the full vector of start-of-period control variables. Standard errors in parentheses are clustered on commuting zone. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively.

2.5 Conclusion

This paper examines the effects of U.S. exposure to international trade in goods and services on U.S. local labor market outcomes between 1991 and 2007 using U.S. multinationals' affiliate sales data provided by the BEA. Our baseline results show that the net employment effect of U.S. exposure to international trade in goods and services is positive during the periods from 1991 to 2007; the average increase in U.S. exposure to international trade in goods and services is associated with a 0.049 percentage point increase in the share of manufacturing employment. The implied employment changes due to U.S. exposure to international trade in goods and services that are based on our analysis are about 1.36 million over the period 1991-2007.

This paper also explores the effects of U.S. exposure to international trade in goods and services on other labor market outcomes such as the number of unemployed workers, the mean log weekly wage, and household income. We find that U.S. exposure to imports from China reduces the number of manufacturing employment and increases the number of unemployed workers. On the other hand, U.S. exposure to FDI inflows increases the number of manufacturing employment and decreases the number of unemployed workers and labor nonparticipation. In terms of the wage effects, the results show that U.S. exposure to imports from China and exports does not significantly affect the mean log weekly wage of all workers at all educational levels, while U.S. exposure to FDI inflows and outflows significantly affects the wage of the working-population workers. We find that the net effects of U.S. exposure to FDI inflows and FDI outflows on wage are slightly positive during the periods from 1991 to 2007. We also find the positive net effects of U.S. exposure to international trade in services on average and median household income and wage.

Bibliography

[1] Acemoglu, Daron, David Autor, Mattoo, David Dorn, Gordon H. Hanson, and Brendan Price. 2016. Import Competition and the Great U.S. Employment Sag of the 2000s. Journal of Labor Economics 34(S2), 141-198.

[2] Autor, David, David Dorn, and Gordon H. Hanson. 2013. The China Syndrome: Local Labor Market Effects of Import Competition in the United States. American Economic Review 103(6), 2121-2168.

[3] Axarloglou, Kostas, and Mike Pournarakis. 2007. Do All Foreign Direct Investment Inflows benefit the Local Economy? The World Economy 30(3), 424-445.

[4] Baldwin, Richard, Henrik Braconier, and Rikard Forslid. 2005. Multinationals, Endogenous Growth, and Technological Spillovers: Theory and Evidence. Review of International Economics 13(5), 945-963.

[5] Becker, Sascha O., Karolina Ekholm, Rober Jackle, and Marc-Andreas Myendler. 2005. Location Choice and Employment Decisions: A Comparison of German and Swedish Multinationals. Review of World Economics 141, 693-731.The Journal of Development Studies

[6] Caliendo, Lorenzo, Robert C. Feenstra, John Romalis, and Alan M. Taylor. 2015. Tariff Reductions, Entry, and Welfare: Theory and Evidence for the Last Two Decades. NBER Working Paper 21768, National Bureau of Economic Research, Cambridge, MA

[7] Chen, Wenjin. 2011. The effect of investor origin on firm performance: Domestic and foreign direct investment in the United States. Journal of International Economics 83(2), 219-228.

[8] Debaere, Peter, Hongshik Lee, and Joonhyung Lee. 2010. It matters where you go: Outward foreign direct investment and multinational employment growth at home, 91(2), 301-309.

[9] Feenstra, Robert C., Hong Ma, and Yuan Xu. 2017. U.S. Exports and Employment. NBER Working Paper 24056, National Bureau of Economic Research, Cambridge, MA

[10] Figlio, David N., and Bruce A. Blonigen. 2000. The Effects of Foreign Direct Investment on Local Communities. Journal of Urban Economics 48, 338-363.

[11] Helpman, Elhanan, Marc J. Melitz, Stephen R. Yeaple. 2004. Export Versus FDI with Heterogeneous Firms, American Economic Review 94(1), 300-316.

[12] Javorcik, Beata S., 2004. Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers Through Backward Linkages. American Economic Review 94(3), 605-627.

[13] Mariotti, Sergio, Marco Mutinelli, and Lucia Piscitello. 2003. Home country employment and foreign direct investment: evidence from the Italian case. Cambridge Journal of Economics 27(3), 419-431.

[14] Pierce, Justin R., and Peter K. Schott. 2009. A Concordance Between Ten-Digit U.S. Harmonized System Codes and SIC/NAICS Product Classes and Industries. NBER Working Paper 15548, National Bureau of Economic Research, Cambridge, MA

[15] Pierce, Justin R., and Peter K. Schott. 2016. The Surprisingly Swift Decline of U.S. Manufacturing Employment. American Economic Review 106(7), 1632-1662.

[16] Romalis, John. 2007. NAFTA's and CUSFTA's Impact on International Trade. The Review of Economics and Statistics 89(3), 416-435.

[17] Tolbert, Charles M., Molly Sizer. 1996. U.S. Commuting Zones and Labor Market Areas: A 1990 Update. Staff Paper 9614. Economic Research Service, U.S. Department of Agriculture.

[18] United Nations Conference on Trade and Development. 2019. The UNCTAD Handbook of Statistics 2019, UN, New York, 2019.

[19] Waldkirch, Andreas, Peter Nunnenkamp, and Jose Eduardo Alatorre Bremont. 2009. Employment Effects of FDI in Mexico's Non-Maquiladora Manufacturing. The Journal of Development Studies 45(7), 1165-1183.

Chapter 3

The Effects of Preferential Trade Agreements on Different FDI Strategies

3.1 Introduction

The proliferation of world economic integration through the rules-based international trade system sponsored by the WTO, as well as by its predecessor agreement, the General Agreement of Tariffs and Trade (GATT), has promoted trade in goods since the mid-1990s. In addition, foreign direct investment (FDI), an important mode of trade in services, has also been promoted through the General Agreement on Trade in services (GATS). Especially, we have witnessed a dramatic increase in the number of PTA formation and FDI flows during the 2000s. The number of preferential trade agreements (PTAs) in force was just 72 in 1999, but it has increased to 337[1] in 2021. Likewise, U.S. multinational foreign affiliate sales were

[1] This number does not include unilateral trade agreements created under the Enabling Clause, where developed countries grant preferential access to developing countries. Moreover, it does not double-account agreements that enable preferential access involving goods as well as services. Finally, inactive agreements have been purged from this number as well. Find more information at https://www.wto.org/english/tratop_e/region_e/region_e.htm.

only \$2.2 trillion in 1999, but they also have reached about \$6 trillion in 2012.[2] Among the total sales of U.S. foreign affiliates in 2012, about 60% were local sales in the host country (i.e., horizontal FDI), while 40% were exported from the host country to either U.S. or other countries. Out of 40%, about one fourth was exported back to the U.S. (i.e., vertical FDI), and the remaining three fourth were exported to third countries (i.e., export-platform FDI).

This paper investigates the effects of the formation of PTAs on three FDI strategies, including vertical, horizontal, and export-platform FDI. Understanding U.S. multinational firms' expansion strategies provides insights as to why U.S. multinationals go abroad and why they choose a particular type of FDI activities. Using the market potential of a host country, a concept initially introduced by Harris (1954), we examine the effects of PTAs on each type of FDI based on the BEA U.S. multinational foreign affiliate sales data from 1983 to 2012. Our empirical results suggest that the formation of PTA between the U.S. and a host country promotes vertical FDI, while the formation of PTAs between a host country and other economic partners increases horizontal and export-platform FDI. We also find that the formation of a deeper form of PTAs (CUs) promotes horizontal and export-platform FDI flows more than the formation of free trade agreements (FTAs). Also, intensive margin effects are always larger than extensive margin effects for all types of FDI. Lastly, the paper finds that these average effects of the market potential on horizontal FDI and export-platform FDI are driven by the exchange of preferential access with partners that do not have a PTA with the same FDI-originating (home) country.

The literature on FDI provides a good understanding of the multinationals' decisions on FDI strategies. Helpman (1984) considers the multinational firms' vertical production activities and develops a general equilibrium model to explain the coexistence of inter-sectoral trade, intra-industry trade, and intra-firm trade. On the other hand, Markusen (1984) develops a general equilibrium model to explain a multinational firm's Horizontal FDI decision to avoid tariffs and other trade costs. Later, Markusen et al. (1996) develop a model known as the "knowledge-capital model" that integrates both vertical and horizontal FDI models

[2] The sales of U.S. multinational foreign affiliates data are provided by the Bureau of Economic Analysis (BEA).

to explain the existence of various combinations of vertical, horizontal, and strictly national firms.[3] Carr, Markusen, and Maskus (1998) empirically test the "knowledge-capital model" and find that bilateral decrease in parent and host country trade costs increases the U.S. multinationals' affiliate production when the host is a developing country (vertical FDI). However, a bilateral decrease in parent and host country trade costs decreases the U.S. multinationals' affiliate production when the host is a high-income country (horizontal FDI).

Literature before the 2000s primarily considers vertical and horizontal FDI. Hanson et al. (2001), however, examine three types of foreign activities of U.S. multinational firms, including vertical, horizontal, and export-platform FDI. They empirically find that U.S. multinationals' foreign affiliates in certain industries and regions export the majority of goods that they produce rather than selling those goods in a host country's local markets. They also find that these export-platform FDI are concentrated in smaller and less-protected economies. Later, Grossman, Helpmen, and Szeidl (2006) develop a model to examine integration strategies of multinational firms and explain the choice among vertical, horizontal, and export-platform FDI.

This paper contributes to the literature on the effects of PTA on different FDI strategies. In general, the literature in the field of international trade has examined the effects of PTA formation on bilateral trade volumes, using the well-known gravity model. Baier and Bergstrand (2007) find that the effects of the formation of PTAs on trade flows are five times as large as traditional estimates suggest, after controlling for endogeneity bias of PTA formation. Baier, Bergstrand, and Feng (2014) use a similar gravity model and find significant heterogeneous effects of PTA formation related to type (FTAs or CUs) on the intensive margin and the extensive margin of trade.[4]

As for the effects of PTAs on FDI, Ekholm et al. (2007) develop a three-region model

[3] They find that vertical FDI dominates production when the countries differ significantly in relative factor endowments but are similar in size. Also, they find that horizontal FDI dominates production when the countries are similar in both size and relative factor endowments and when trade costs are moderate to high.

[4] Baier, Bergstrand, and Feng (2014) use the methodology introduced in Hummels and Klenow (2005) to define the intensive and extensive margins of trade.

considering two identical large economies with a high-cost production process and a small economy with a low-cost production process. They find that the formation of a Free Trade Agreement (FTA) between a large economy and a small economy can lead to the insider firm in the large economy selecting vertical or export-platform FDI in the small economy and the outsider firm in another large economy selecting export-platform FDI.[5] Baltagi et al. (2008) investigate the impact of European Economic Area (EEA)[6] membership on intra-EEA FDI. They find that the enlargement of existing free trade areas reallocates FDI from existing members to new member countries.

This paper extends Hiraide, Shen, and Silva (2020) by considering the effects of the market potential of a host country, which takes into account not only the size of the recipient country's economy but also the markets to which the recipient can access on a preferential basis, on total FDI from the home country. In this case, we focus on the effects of a host country's market potential on different types of FDI, including vertical, horizontal, and export-platform FDI. Our paper's main contributions are summarized in the following four points. First, we distinguish the types of FDI by the destination of foreign affiliates' sales to examine the effects of the formation of PTAs on different types of FDI. Second, we examine the heterogeneous effects of different types of PTAs (FTAs or CUs) on different FDI strategies. Third, we examine the effects of different types of PTAs on the intensive and extensive margins of each type of FDI. Lastly, we investigate the importance of the interdependence of PTAs by controlling for the presence of specific hub-and-spoke PTAs in which the preferential markets that a country has access to and the FDI-sourcing (home) country also have a PTA in place.

The remainder of this paper is organized as follows. Section 2 discusses the empirical methodology, which includes the econometric model and the description of the main variables. Section 3 describes the data used in the analysis. Sections 4 and 5 provide the main econometric results and the results from the robustness tests, respectively. Section 6 con-

[5]They also empirically show that U.S. multinationals' affiliates located in NAFTA export their goods mainly to the U.S. (vertical FDI), while U.S. multinationals' affiliates located in the EU export their goods mainly to other countries within the EU (export-platform FDI).

[6]The European Economic Area (EEA) consists of the 27 EU member States and the three EFTA states (Iceland, Liechtenstein, and Norway).

cludes the paper.

3.2 Methodology

This paper investigates the role that PTA formation plays in determining different FDI strategies, including vertical, horizontal, and export-platform FDI. Specifically, the paper examines whether the formation of PTAs enlarges the market potential of a host country, a concept initially introduced by Harris (1954), and it examines whether an increase in the market potential of a host country can enhance each type of FDI. We follow the specification of market potential introduced in Chen (2009). In this case, market potential includes not only the size of the FDI recipient country's economy but also includes the markets to which the recipient can access on a preferential basis.[7] Also, we allow for the heterogeneous effects of market potential constructed based on the different types of PTAs (FTAs and CUs), as well as controlling for heterogeneous effects due to the presence of PTAs involving a host country's preferential partner and the FDI-sourcing (home) country. Moreover, we examine the effects of the market potential on the intensive and extensive margins of FDI. The following expressions describe our baseline specifications for vertical, horizontal, and export-platform FDI:

$$VFDI_{us,it} = \alpha_0 + \alpha_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it} \tag{3.1}$$

$$HFDI_{us,it} = \beta_0 + \beta_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it} \tag{3.2}$$

$$EPFDI_{us,it} = \gamma_0 + \gamma_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it}, \tag{3.3}$$

where $VFDI_{us,it}$, $HFDI_{us,it}$ and $EPFDI_{us,it}$ stand for the U.S. multinational foreign affiliate vertical, horizontal, and export-platform FDI sales in host country i at year t, respectively. X_{it} is a vector with host country i's characteristics at year t, including corporate tax and GDP per capita. ψ_i and μ_t are host country and year fixed effects, respectively.[8] ϵ_{it} is the

[7] We will use the terminology "recipient" and "host" country/economy interchangeably throughout the paper.

[8] Notice that time-invariant characteristics are absorbed by the host country fixed effects ψ_i. In addition, the host country's capital-labor ratios are proxied by the host country's GDP per capita, while the U.S. capital-labor ratios are controlled for by the year fixed effects μ_t.

error term.

M_{it} in the specifications (3.1), (3.2), and (3.3) represents the market potential of host country i at year t. M_{it} is the main variable of interest in this study. This variable is defined to control for the additional market access that a U.S. multinational enjoys due to the host country i's preferential access to other relevant markets. Based on Chen (2009)'s specification, we construct the market potential variable as follows:

$$\begin{aligned} M_{it} &\equiv \text{Market Potential of country } i \text{ at year t} \\ &= \underbrace{\omega_0 Y_{it}}_{\text{host country } i \text{ market size}} + \underbrace{\omega_1 \left(PTA_{us,it} * \frac{Y_{us,t}}{\tau_{us,i}} \right)}_{\text{weight of U.S.}} + \underbrace{\omega_2 \sum_{j \neq us,i} \left(PTA_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of host}} \\ &+ \underbrace{\omega_3 \sum_{j \neq i} \left((1 - PTA_{ijt}) * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of ROW}}, \end{aligned} \tag{3.4}$$

where Y_{it}, $Y_{us,t}$, and Y_{jt} represent the market size of the host country i, the market size of the U.S., and the market size of another country j at year t, respectively. $PTA_{us,it}$ is a binary variable that equals one if the U.S. and the host county i have a preferential trade agreement in place at year t, and zero otherwise; while PTA_{ijt} also represents a binary variable that identifies whether host country i and country j have a preferential trade agreement in year t. Variables $\tau_{us,i}$ and τ_{ij} represent transportation costs between the U.S. and the host country i, and the transportation cost between countries i and j, respectively.

In addition, we investigate how the interdependence among various PTAs may affect a country's ability to attract each type of FDI inflows. Especially, we examine whether additional PTAs involving a host country's preferential trade partner(s) and the home country (the United States in this study) may hinder the host country's ability to attract FDI inflows through the formation of PTAs. To investigate the interdependence among various PTAs, we additionally control for the presence of a PTA involving a host country's preferential trade partner and the home country. For this purpose, we split the term "weight of host" into two components which control for the presence of PTAs involving a preferential partner and the home country as follows:

$$\text{weight of host} = \sum_{j \neq us,i} \left(I_{ijt}^{\text{no US}} * PTA_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right) + \sum_{j \neq us,i} \left(\left(1 - I_{ijt}^{\text{no US}}\right) * PTA_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right), \quad (3.5)$$

where the binary variable $I_{ijt}^{\text{no US}}$ equals one if country j has no PTA in place with the U.S. at year t, and zero otherwise.

Next, we investigate the heterogeneous effects of the FTAs and CUs on each type of FDI. This distinction is important since the coordination of external tariffs characteristic of CUs leads to common external tariffs that are higher than external tariffs under an FTA. This result may provide greater incentives for U.S. multinationals to conduct horizontal and export-platform FDI into members of a CU than into members of an FTA to avoid higher external tariffs set by CU members. Following Baier, Bergstrand, and Feng (2014), we adopt the assumption that common markets and economic unions are considered as part of the group of CUs since these agreements tend to be deeper than agreements involving the formation of FTAs. Thus, the market potential variable is measured using information for FTA and CU members separately, allowing estimation of the following expression:

$$VFDI_{it} = \alpha_0 + \alpha_1 X_{it} + M_{it_{FTA,CUs}} + \psi_i + \mu_t + \epsilon_{it} \quad (3.6)$$

$$HFDI_{it} = \beta_0 + \beta_1 X_{it} + M_{it_{FTA,CUs}} + \psi_i + \mu_t + \epsilon_{it} \quad (3.7)$$

$$EPFDI_{it} = \gamma_0 + \gamma_1 X_{it} + M_{it_{FTA,CUs}} + \psi_i + \mu_t + \epsilon_{it}, \quad (3.8)$$

where

$$\begin{aligned} M_{it_{FTA,CUs}} = & \underbrace{\omega_0 Y_{it}}_{\text{host country } i \text{ market size}} + \underbrace{\omega_1 \left(\text{PTA}_{us,it} * \frac{Y_{us,t}}{\tau_{us,i}} \right)}_{\text{weight of U.S.}} + \underbrace{\omega_2 \sum_{j \neq i,h} \left(\text{FTA}_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of host (FTA)}} \\ & + \underbrace{\omega_3 \sum_{j \neq i,h} \left(\text{CUs}_{ijt} * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of host (CUs)}} + \underbrace{\omega_4 \sum_{j \neq i} \left((1 - \text{PTA}_{ijt}) * \frac{Y_{jt}}{\tau_{ij}} \right)}_{\text{weight of ROW}}. \end{aligned} \quad (3.9)$$

Finally, we investigate the effects of PTAs on margins of FDI (intensive and extensive margins). The intensive margin of FDI considers how much U.S. multinationals expand existing FDI within industries, while the extensive margin of FDI considers whether U.S. multinationals start new FDI in some industries. An increase in the intensive margin means that existing industry-level FDI increases and an increase in the extensive margin means there are new FDI on some industries where U.S. multinationals had not previously invested in. Baier, Bergstrand, and Feng (2014) consider the different effects of PTA formation on the intensive and extensive margins of trade, following Hummels and Klenow's (2005) decomposition method. Unfortunately, there is not enough publicly available data to apply Hummels and Klenow's (2005) decomposition method in the case of FDI flows.[9] Therefore, this paper considers the effects of PTA formation on the different margins of FDI, using the following methodology to decompose aggregate FDI flows into its intensive and extensive margins.

(Decomposition Method)

$$IM_{it} = FDI_{it} \times \left(\frac{\text{the number of industries with nonzero FDI in t-1 and t}}{\text{total number of industries}} \right) \tag{3.10}$$

$$EM_{it} = FDI_{it} \times \left(\frac{\text{the number of industries with zero FDI in t-1 and nonzero FDI in t}}{\text{total number of industries}} \right), \tag{3.11}$$

where IM_{it} and EX_{it} stand for the intensive margin and the extensive margin of FDI in host country i at year t, respectively. Expression (3.10) indicates that we define the intensive margin of FDI as total affiliate sales in country i multiplied by the fraction of industries with nonzero affiliate sales in year $t-1$ and nonzero affiliate sales in year t. Similarly, we define the extensive margin of FDI as total affiliate sales in country i multiplied by the fraction of industries with zero affiliate sales in year $t-1$ and nonzero affiliate sales in year t. This

[9] The application of Hummels and Klenow's (2005) decomposition method requires industry-level information about the U.S. multinational affiliate sales to FDI recipient countries, as well as the rest of the world's multinational affiliate sales to FDI recipient countries. Unfortunately, there is no publicly available data for the rest of the world's multinational affiliate sales to the 43 FDI recipient countries used in our sample.

methodology allows us to decompose total U.S. multinational foreign affiliate sales into the intensive and extensive margin of FDI. Applying this decomposition method in specification (3.1), (3.2), and (3.3) allows us to estimate the effects of PTA formation on the different margins of FDI as follows.

$$IM\_VFDI_{it} = \theta_0 + \theta_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it} \tag{3.12}$$

$$EM\_VFDI_{it} = \lambda_0 + \lambda_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it} \tag{3.13}$$

$$IM\_HFDI_{it} = \theta_0 + \theta_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it} \tag{3.14}$$

$$EM\_HFDI_{it} = \lambda_0 + \lambda_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it} \tag{3.15}$$

$$IM\_EPFDI_{it} = \theta_0 + \theta_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it} \tag{3.16}$$

$$EM\_EPFDI_{it} = \lambda_0 + \lambda_1 X_{it} + M_{it} + \psi_i + \mu_t + \epsilon_{it} \tag{3.17}$$

Notice that we also combine our definition of the term "weight of host" in expression (3.5) to investigate the heterogeneous effects of interdependence across PTAs and their effects on the margins of trade.

The robustness of our results is tested by modifying the econometric strategy used to obtain our main results. Specifically, we test our results by differencing the data over 5-year periods to increase estimation efficiency instead of the fixed-effect estimator. Wooldridge (2010, Ch.10) suggests that the fixed-effect estimator is more efficient when the error terms are serially uncorrelated. However, the error terms in our main specification may be serially correlated over time, which means then that the fixed-effect model is less efficient. Furthermore, Wooldridge (2000, p.447) also notes that if the FDI and GDP variables follow a unit-root process and the number of periods is large, then the spurious regression problem can arise in a panel using a fixed-effects strategy. Therefore, as Baier, Bergstrand, and Feng

(2014) suggest, we test the robustness of our results by taking the first difference of the panel data over 5-year periods.

Furthermore, Baier and Bergstrand (2007) argue that trade policy is not an exogenous variable and Blanchard and Matschke (2015) also suggest that the presence of simultaneity between the decision of the host country i to form a PTA with the U.S. and the U.S. multinationals' FDI activities. We, therefore, employ an instrumental variable method to correct for the potential endogeneity bias of PTA formation using the method outlined in Hiraide, Shen, and Silva (2020).

3.3 Data

In this paper, we measure FDI by the sales of U.S. multinational foreign affiliates in 43 countries from 1983 to 2012. We use the U.S. multinational foreign affiliate sales data provided by the Bureau of Economic Analysis (BEA), which contains nine industries and 57 countries.[10] The BEA dataset reports the destinations of total U.S. multinational affiliate sales, including sales to the U.S. (vertical FDI), sales in host countries (horizontal FDI), and sales to foreign countries other than the host country (export-platform FDI). The sample used in the econometric exercises relies on a subsample of 43 countries that allows consideration of the U.S. multinational affiliate sales from 1983 to 2012.[11]

Figure 3.1 shows the sales of U.S. multinational foreign affiliates from 1983 to 2012. This figure divides the aggregate sales of U.S. multinational affiliates into the sales to the U.S. (vertical FDI), the sales in host countries (horizontal FDI), and the sales to foreign countries other than the host country (export-platform FDI). Overall, the aggregate sales of U.S. multinational foreign affiliates have increased for the past three decades. In 1983,

[10] Notice that a SIC-based ISI industry classification is used before 1999 and a NAICS-based ISI industrial classification is introduced in 1999 and is used thereafter. The industry-level aggregation is defined differently in each classification to add some newly defined sectors. This paper follows the SIC-based industry classification, which implies converting the newer NAICS-based classification into the SIC-based classification since the latter is more aggregated. As a result, there are nine industries in the dataset, including Chemicals, Electrical equipment, Finance and Insurance, Food, Machinery, Primary and fabricated metals, Services, Transportation equipment, and Wholesale trade industries.

[11] The 43 countries (out of 57 countries) in the dataset are selected based on data availability. The U.S. sales data for the selected 43 countries are available during the whole period from 1983 to 2012, while there is a significant discontinuity in the data for the remaining 14 countries.

the U.S. multinational foreign affiliate sales were just US$0.6 trillion, but it reached about US$5.5 trillion in 2012. Similarly, each type of FDI has also increased over the past decades. The sales to the U.S. (vertical FDI) by U.S. multinational foreign affiliates was just US$0.16 trillion in 1983, but it reached about US$0.5 trillion in 2012. The sales in host countries (horizontal FDI) have tripled since 1983 and reached US$3.2 trillion in 2012. Also, the sales to foreign countries other than the host country (export-platform FDI) have quadrupled since 1983 and reached US$1.6 trillion in 2012.

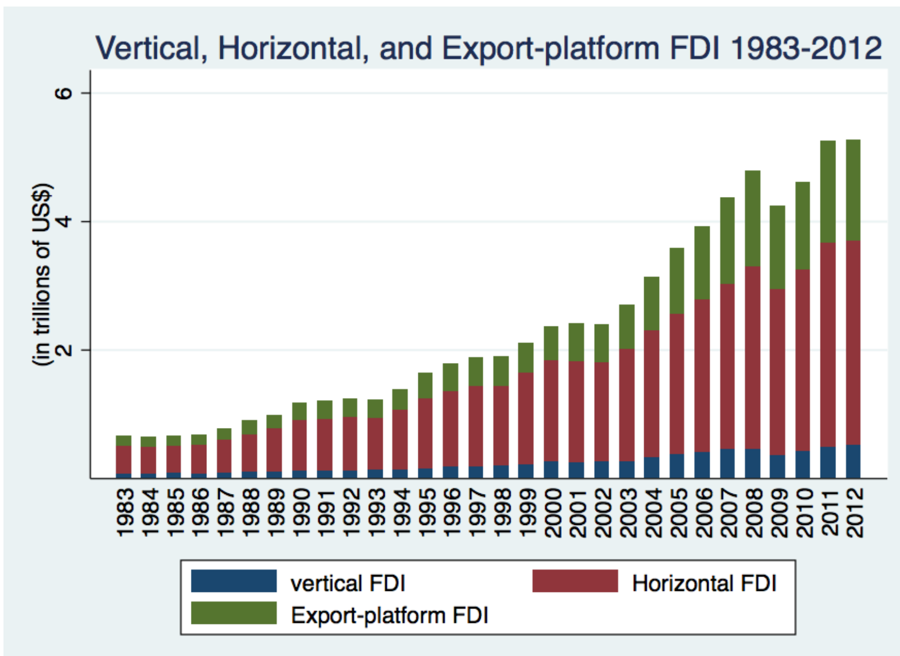


Figure 3.1: U.S. multinational foreign affiliate sales from 1983 - 2012

This increase in the amount of U.S. multinationals' FDI activities coincides with a surge in the formation of PTAs over the past three decades. According to Figure 3.2[12], the number of PTAs in force was just 72 in 1999, but the number quintupled to 233 active agreements in 2012 and reached 337 active agreements in 2021. Both the increase in the sales of U.S. multinational foreign affiliates and the increase in the number of PTAs in the past three decades show that U.S. multinationals have increased their economic activities abroad and moved their production across borders. Also, PTAs take different forms; more than 90% of

[12]Source: WTO regional trade agreements database: https://www.wto.org/english/tratop_e/region_e/region_e.htm

the current agreements take the form of Free Trade Areas (FTAs) or other partial-scope agreements, while the remainder takes the form of Custom Unions (CUs).[13] The distinction between FTAs and CUs is important because FTAs provide member countries more flexibility in tariff setting by allowing them to set different external tariffs, while CUs require member countries to adopt a common external tariff. We, therefore, investigate the heterogeneous effects of different types of PTAs on each type of FDI specified in (3.6), (3.7), and (3.8).

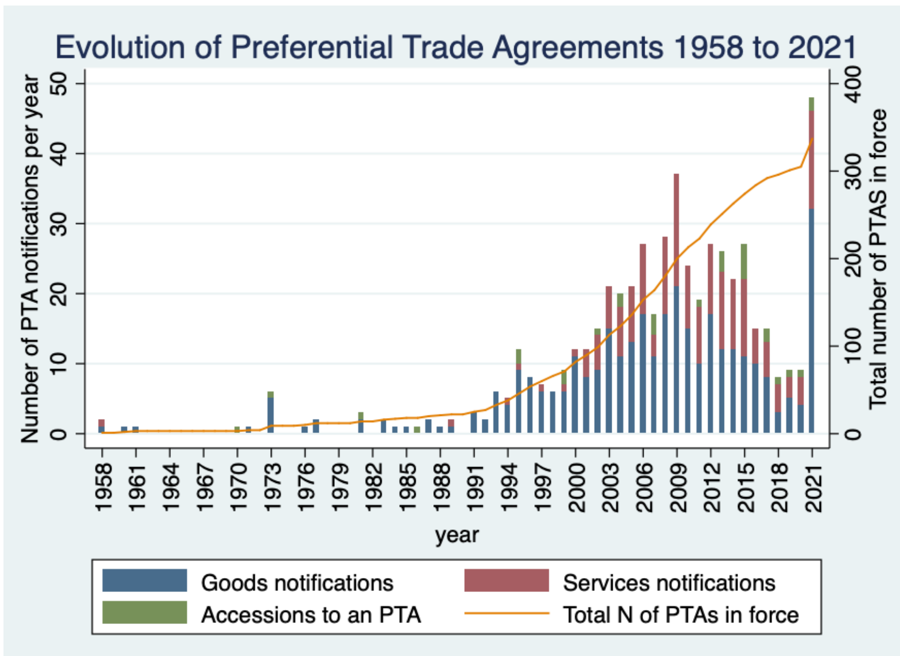


Figure 3.2: The number of PTAs in force

Figure 3.3 shows the ratio of each type of FDI to total FDI activities by U.S. multinationals. In 1983, vertical, horizontal, and export-platform FDI consisted of 9.6%, 66.2%, and 24.2% of total FDI sales, respectively. Vertical FDI has remained about 10% of the aggregate sales of U.S. multinational affiliates for the past three decades, while the ratio of export-platform FDI to total FDI has started to increase in 2004, and it reached 29.8% in 2012. The ratio of horizontal FDI to total FDI has correspondingly started to decrease in 2004, and it became 60.3% in 2012. Figure 3, therefore, shows that U.S. multinationals mildly increased their export-platform FDI over the past decades relative to the other two

[13] According to the World Trade Organization, 94.9% of the PTAs take the form of FTAs or other limited scope agreements, while 5.1% of the PTAs take the form of CUs.

FDI strategies.

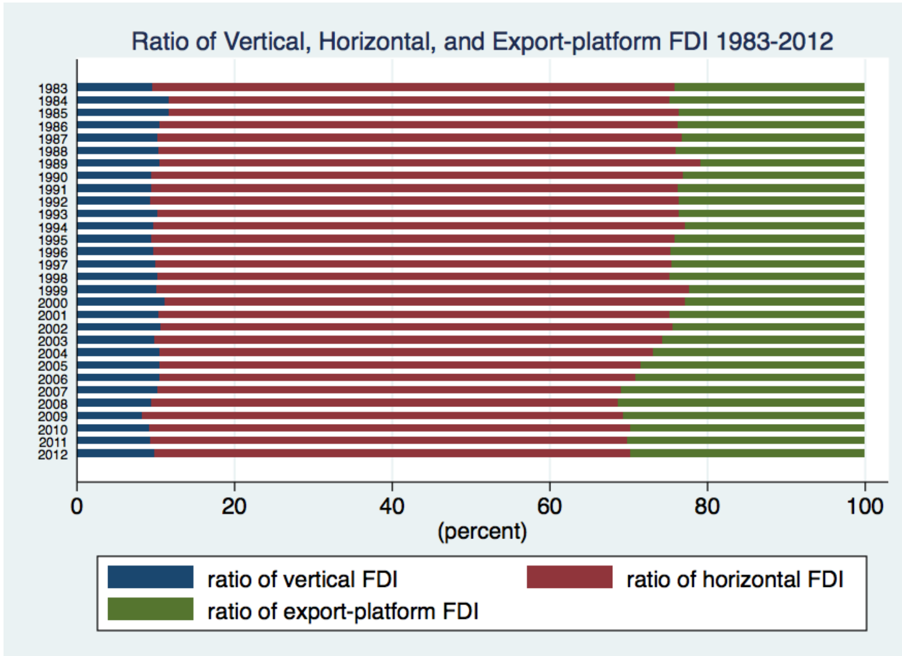


Figure 3.3: Ratio of vertical, horizontal, and export-platform FDI from 1983 - 2012

The world economic-integration process through the formation of PTAs has led to a situation where a single host country forms multiple PTAs with other economic partners. For instance, Chile formed a PTA with the U.S. in 2004 and also formed additional 29 PTAs with other economic partners during the period from 2005 to 2012. Similarly, Switzerland and Norway have formed 30 and 28 PTAs by the end of 2012, respectively, although both countries have not formed a PTA with the U.S. yet. Consequently, the investigation of the effects of the formation of PTAs on each type of FDI requires considering not only whether the host country has a PTA with the home country, but also the importance of all additional markets to which the host economy can export on a preferential base. Establishing a presence in the host country through FDI is important for U.S. multinationals to trade goods (export and import) on a preferential basis with the host country's preferential partners.

We construct the market potential variable as defined in expression (3.4) to measure the host country's market potential. The market potential variable controls for the U.S. market size (weight of U.S.), host country i's market size, its preferential partners' market size (weight of host), and the rest-of-the-world market size (weight of ROW). We are interested in examining the contribution of host country i's PTA with the U.S.–i.e., "weight of U.S." in expression (3.4) to the vertical FDI conducted by U.S. multinationals as we assume that U.S. multinationals' motivation for vertical FDI is to produce intermediate and final goods in a host country and to export those goods back to the U.S. As for horizontal FDI, we are interested in examining the contribution of host country's market size as we assume that U.S. multinationals' motivation for horizontal FDI is to seek access to host country's market. Lastly, we examine the contribution of host country i's PTAs with other countries excluding the home country that directly conducts FDI in the host country–i.e., "weight of host" in expression (3.4) on export-platform FDI.

Panel A of Table 3.1 displays the top ten countries with the highest values of vertical FDI and with the highest values of weight of U.S. in 2012. Only three countries (Canada, Mexico, and Singapore) out of ten countries with the highest values of vertical FDI have the highest values of weight of U.S. This implies that U.S. multinationals may choose vertical FDI destinations based not only on the existence of PTA with the U.S. but also on other host country's characteristics. Similarly, Panel B of Table 3.1 displays the top ten countries with the highest values of horizontal FDI and with the highest host country GDP in 2012. Six countries out of ten countries with the highest values of horizontal FDI have the highest GDP in our sample. This implies that U.S. multinationals tend to conduct horizontal FDI in a host country with a larger market size. Of course, this does not explain the causal relationship between horizontal FDI and the host country's GDP. We, therefore, test the effects of the host country's GDP on horizontal FDI through rigorous econometric analysis. Also, Panel C of Table 3.1 displays the top ten countries with the highest values of export-platform FDI and with the highest values of weight of host in 2012. Seven countries out of ten countries with the highest values of export-platform FDI have the highest weight of host. This implies that U.S. multinationals tend to utilize a host country as an export-platform when the host country has a larger preferential market through the formation of PTAs with other economies.

We collect data on corporate tax from KPMG Corporate Tax Rates Survey. Whenever

Table 3.1: Correlation between vertical FDI and weight of U.S. in 2012

Panel A			
Top 10	vertical FDI	Top 10	weight of US
Canada	**139,589**	**Canada**	**7,474**
Ireland	64,271	**Mexico**	**6,296**
Mexico	**50,954**	Peru	2,628
UK	44,153	Chile	1,863
Singapore	**33,365**	Israel	1,477
Switzerland	29,772	Korea	1,454
China	15,778	Australia	1,050
Germany	15,451	**Singapore**	**1,027**
Hong Kong	11,895	-	-
Bermuda	11,661	-	-

Panel B			
Top 10	horizontal FDI	Top 10	host country GDP
Canada	**486,365**	**China**	**7,207,389**
UK	**422,470**	**Japan**	**5,778,634**
Germany	**204,944**	**Germany**	**3,559,799**
Japan	**183,674**	France	**2,706,968**
China	**180,733**	**UK**	**2,706,968**
Brazil	**152,311**	**Brazil**	**2,340,784**
Mexico	149,476	Italy	2,077,184
France	141,922	India	1,863,407
Singapore	139,899	**Canada**	**1,693,132**
Australia	133,779	Spain	1,375,829

Panel C			
Top 10	export-platform FDI	Top 10	weight of host
Singapore	224,341	**Belgium**	**31,964**
Switzerland	**191,401**	**Netherlands**	**29,184**
Ireland	**174,697**	**Switzerland**	**26,439**
UK	**154,009**	Denmark	20,245
Netherlands	**104,781**	Austria	19,816
Germany	**102,002**	**Ireland**	**17,984**
Belgium	**81,146**	**France**	**17,888**
France	**60,502**	**Germany**	**17,763**
Hong Kong	45,906	**UK**	**17,087**
Australia	36,325	Norway	14,395

corporate tax information for a country is unavailable, we then use the latest available corporate tax rate for that country. Market size is measured using the information on real GDP data from the World Bank's development indicators, while we use real GDP per capita as a proxy for the country-level capital/labor ratios from the same source.[14] Furthermore, the trade cost between two countries is measured using the bilateral distance data constructed by Head and Mayer (2003).

We use information on PTAs organized by Scott Baier and Jeffrey Bergstrand.[15] Our main results consider that a PTA is present if either an FTA or a CU is active. Following common assumptions used in the literature, common markets (CMs), and economic unions (ECUs) are considered part of the CU group. Two variables are constructed to assist in measuring the market potential variable described by expression (3.4): The binary variable 'PTA' equals to one if two countries are members of the same preferential agreement, and is zero otherwise; while, for the country-pairs that are part of a PTA, a binary variable labeled 'FTA' equals one if two countries are part of the same FTA, and zero if they are part of a CU.

Table 3.2 presents the summary statistics of the main panel dataset. The dataset based on the U.S. multinational foreign affiliate sales contains 1,290 observations (43 host countries over 30 years from 1983 to 2012). The total affiliate sales are not exactly equal to the sum of vertical, horizontal, and export-platform FDI sales as some of the data were suppressed in BEA datasets to avoid the disclosure of information on an individual company even at the total sales level.[16] The information on the intensive and extensive margins is limited to 1,247 observations since one year of data is lost in calculating the FDI margins. The standard deviation of the different components of market potential is used in determining the effects of PTA formation on FDI flows. Table 3.3 shows the summary statistics of the intensive and

[14]GDP and GDP per capita data for Taiwan are collected from the Republic of China's National Statistics website.

[15]Their dataset can be downloaded from Kellogg Institute for International Studies' website at kellogg.nd.edu/nsf-kellogg-institute-data-base-economic-integration-agreements.

[16]We treated these suppressed data as zero sales in our analysis. As a result, there are 68 zero observations (out of 1,290 total observations) in vertical FDI sales, 60 zero observations in horizontal FDI sales, and 35 zero observations in export-platform FDI in our dataset, respectively.

extensive margins of vertical, horizontal, and export-platform FDI sales, respectively.

Table 3.2: Summary statistics for the U.S. affiliate sales dataset

Panel A						
Variable	**Units**	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
U.S. affiliate sales	(in millions of USD)	54717.881	93641.834	0	664152	1290
vertical FDI sales	(in millions of USD)	5342.594	13847.906	0	139589	1290
horizontal FDI sales	(in millions of USD)	33864.733	62777.379	0	486365	1290
export-platform FDI sales	(in millions of USD)	14568.064	29206	0	224341	1290
weighted distance	(in kilometers)	9001.103	3604.003	2079.297	15535.873	1290
host country i GDP per capita	(in US dollar)	25802.572	20806.644	423.593	94903.192	1290
U.S. GDP	(in millions of USD)	2755505.391	6874947.5	15542162	1290	
host GDP	(in millions of USD)	5653.91	7358.822	0	31964.038	1290
weight of U.S.	(in millions of USD/km)	240.41	1059.955	0	7474.721	1290
weight of host	(in millions of USD/km)	5653.91	7358.822	0	31964.038	1290
j has no PTA with U.S.	(in millions of USD/km)	5575.979	7316.467	0	31614.837	1290
j has PTA with U.S.	(in millions of USD/km)	77.931	120.818	0	991.433	1290
weight of ROW	(in millions of USD/km)	3318.541	1954.689	427.974	14899.656	1290
corporate tax	(percentage)	31.71	9.364	0	56.66	1290
year	-	-	-	1983	2012	1290

Panel B (weight of host with FTA and CUs)						
Variable	**Units**	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
weight of host (FTA)	(in millions of USD/km)	1482.12	3516.069	0	26439.311	1290
j has no PTA with US	(in millions of USD/km)	1404.189	3497.065	0	25927.181	1290
j has PTA with US	(in millions of USD/km)	77.931	120.818	0	991.433	1290
weight of host (CUs)	(in millions of USD/km)	4171.79	6752.3	0	30335.279	1290

Table 3.3: Summary statistics for the Intensive and Extensive margins of the U.S. affiliate sales

Variable	**Units**	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Vertical FDI sales	(in millions of USD)	5477.407	14047.692	0	139589	1247
intensive margin of vertical FDI	(in millions of USD)	5135.079	13669.974	0	139589	1247
extensive margin of vertical FDI	(in millions of USD)	342.329	1263.061	0	18701.334	1247
Horizontal FDI sales	(in millions of USD)	34690.419	63597.32	0	486365	1247
intensive margin of horizontal FDI	(in millions of USD)	32774.764	62757.249	0	486365	1247
extensive margin of horizontal FDI	(in millions of USD)	1915.655	4766.782	0	55492.227	1247
Export-platform FDI sales	(in millions of USD)	14942.834	29610.576	0	224341	1247
intensive margin of export-platform FDI	(in millions of USD)	13786.65	27768.788	0	199414.219	1247
extensive margin of export-platform FDI	(in millions of USD)	1156.184	3620.265	0	43812.336	1247

3.4 Main Empirical results

Table 3.4 shows baseline regression results based on the specifications (3.1), (3.2), and (3.3). Columns (1) and (2) show the effects of the market potential of a host country based on expression (3.1) on vertical FDI. Column (1) shows that the estimated coefficient of weight of U.S. is positive and significant, while the estimated coefficient of weight of host is negative and insignificant. The positive and significant coefficient of weight of U.S. suggests that U.S. multinational firms tend to conduct vertical FDI in a host country and export goods from their foreign affiliates to the U.S. using the PTA between the U.S. and the host country. The estimated coefficient of 6.916 on weight of U.S. implies that a one-standard-deviation increase in host country i's market potential related to the formation of a PTA with the U.S. is associated with an increase of about US$7.33 billion (6.916 multiplied by 1059.955) in the U.S. multinational vertical FDI.

On the other hand, the insignificant coefficient of weight of host suggests that the formation of PTAs between the host country and its economic partners (i.e., country j) does not promote the U.S. multinational vertical FDI as expected. The specification used in column (2) splits the effects of the weight of host into two components based on the existence of PTA between the U.S. and host country i's preferential partners. The results in column (2) also show that the existence of PTA between the U.S and host country i's preferential partners also has no effect on vertical FDI into a host country i.

Columns (3) and (4) show the effects of the market potential of a host country on horizontal FDI. The estimated coefficients of the host country's GDP, of the contribution of a PTA between the host and the U.S. (weight of U.S.), and of the market access generated by the formation of PTAs between the host and other countries (weight of host) are all positive and statistically significant. In column (3), the estimated coefficient of 0.038 on host country i's GDP implies that an increase of US$100 billion in host country i's GDP is associated with an increase of US$3.8 billion in the U.S. multinationals' horizontal FDI into the host country i.[17] The positive and significant coefficient of weight of host in column (3) suggests that U.S.

[17] In our data, the average U.S. multinationals' horizontal FDI is US$ 33.864 billion. This means that the

multinationals conduct horizontal FDI in a host country i when its preferential markets expand through the formation of PTAs with its trade partners. For example, consider the case of Ford of Europe's assembly plant in Germany. It is beneficial for Ford's assembly plant in Germany to have preferential access to other European economies. This enables the plant to import parts and components from other European countries without trade costs. This fragmentation of production by the Ford of Europe's assembly plant in Germany makes it possible for them to produce the final products more efficiently with those imported parts, avoid EU tariffs, and sell the final products either in Germany or other EU markets.

Furthermore, column (4) splits the effects of the weight of host to examine whether the effects of an increase in market potential through PTA formation on horizontal FDI is driven by PTAs with trade partners that do not have an agreement with the U.S. The results in column (4) confirm that PTA formation increases horizontal FDI only if the preferential partners do not have a PTA with the U.S. On the other hand, the estimated coefficient of weight of host is negative and significant when preferential partners do have a PTA with the U.S. This implies that the formation of PTAs with countries that also exchange preferential access with the U.S. increases the competition among countries, and this can reduce horizontal FDI into a host country i from U.S. multinational firms.

Quantitatively, the estimated coefficient of 2.424 on weight of host in column (3) implies that a one-standard-deviation increase in market potential related to the formation of PTAs between the host economy and other countries is associated with an increase of about US\$17.84 billion (2.424 multiplied by 7358.822) in the U.S. multinational horizontal FDI. Also, in column (4), the estimated coefficient of 2.537 on weight of host (j has no PTA with U.S.) implies that a one-standard-deviation increase in market potential related to the formation of PTAs between the host economy and other countries that do not have a PTA with the U.S. is associated with an increase of about US\$18.56 billion (2.537 multiplied by 7316.467) in the U.S. multinational horizontal FDI. On the other hand, the estimated coefficient of -20.963 on weight of host (j has PTA with U.S.) shows that a one-standard-

US\$100 billion increase in host country i's GDP is associated with an 11.2% increase (= US\$3.8 billion) in the U.S. multinationals' horizontal FDI into the host country i

deviation increase in the variable is associated with a decrease of about US$2.53 billion (-20.963 multiplied by 120.818) in the U.S. multinational horizontal FDI.

Columns (5) and (6) show the effects of the market potential of a host country on export-platform FDI. Column (5) shows that the estimated coefficient of the market access generated by the formation of PTAs between the host and country j (weight of host) is positive and significant. This suggests that U.S. multinationals conduct export-platform FDI in a host country that has access to a larger preferential market. These U.S. multinational foreign affiliate firms export goods to third economies, country j, using the preferential access between the host country and country j. For example, Ford of Europe established multiple assembly plants in Belgium, Germany, and Spain. These plants assemble various types of Ford vehicles. They sell the final products not only in the host country but also in other EU members and other preferential partners outside the EU. The estimated coefficient of 5.042 on weight of host implies that a one-standard-deviation increase in market potential related to the formation of PTAs between the host country and other countries is associated with an increase of about US$37.10 billion (5.042 multiplied by 7358.822) in the U.S. multinational export-platform FDI.

Column (6) additionally finds that PTA formation between the host and its economic partners increases export-platform FDI from the U.S. multinationals only if the preferential partners do not have a PTA with the U.S. The estimated coefficient of 5.061 on weight of host (j has no PTA with U.S.) implies that a one-standard-deviation increase in market potential related to the formation of PTAs between the host country and other countries is associated with an increase of about US$37.03 billion (5.061 multiplied by 7316.467) in the U.S. multinational export-platform FDI.

The estimated coefficient of weight of ROW in columns (5) and (6) are also positive and significant. However, it is unclear whether these results make economic sense or not. One possible explanation for the positive coefficient on weight of ROW could be related to tariffs reductions resulting from the formation of FTAs among countries in the ROW. As we discussed above, the vast majority of current PTAs take the form of FTAs. This fact suggests that external tariffs set by countries in the ROW could be lowered by the formation of these FTAs, which is called tariff complementarity effects. Therefore, the host country may increase its market access to economies in the ROW, which could allow the U.S. multinational firms to use the host country i as an export platform to sell goods to the ROW.

Notice that all other control variables describing the characteristics of the host country are also consistent with expectations. The results suggest that host countries with a higher capital/labor ratio tend to attract more U.S. multinationals' affiliate sales for all types of FDI. In contrast, host countries with higher corporate tax discourage all types of FDI. Also, the estimated coefficients of the host country's GDP and weight of U.S. are also positive and significant. These results indicate that a host country receives vertical, horizontal, and export-platform FDI more when the host country improves its market potential by forming a PTA with the U.S. and by having a bigger market size.

Table 3.4: The effect of market potential of host country i on the types of U.S. multinational FDI[a]

VARIABLES	(1) vertical FDI	(2) vertical FDI	(3) horizontal FDI	(4) horizontal FDI	(5) export-platform FDI	(6) export-platform FDI
host country i GDP per capita	0.340***	0.342***	0.846***	0.860***	0.963***	0.965***
	(0.049)	(0.049)	(0.134)	(0.134)	(0.184)	(0.183)
corporate tax	-322.577***	-316.453***	-658.793**	-616.490**	-465.009***	-457.824***
	(71.090)	(69.907)	(274.731)	(271.798)	(162.907)	(161.327)
host GDP	0.002***	0.002***	0.038***	0.038***	0.005***	0.005***
	(0.000)	(0.000)	(0.004)	(0.004)	(0.001)	(0.001)
weight of U.S.	6.916***	6.851***	20.570***	20.122***	1.817***	1.741***
	(0.539)	(0.537)	(2.159)	(2.144)	(0.385)	(0.430)
weight of host	-0.003		2.424***		5.042***	
	(0.165)		(0.741)		(0.554)	
j has no PTA with U.S.		0.014		2.537***		5.061***
		(0.162)		(0.737)		(0.548)
j has PTA with U.S.		-3.389		-20.963***		1.070
		(2.395)		(7.516)		(7.742)
weight of ROW	0.527**	0.406*	3.273***	2.439***	2.600***	2.458***
	(0.206)	(0.222)	(0.893)	(0.944)	(0.876)	(0.932)
Observations	1,290	1,290	1,290	1,290	1,290	1,290
R-squared	0.875	0.875	0.871	0.872	0.769	0.769
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Host country i fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of host country i	43	43	43	43	43	43

[a] Dependent variable: Total U.S. multinational vertical FDI in columns (1) and (2). Total U.S. multinational horizontal FDI in columns (3) and (4). Total U.S. multinational export-platform FDI in columns (5) and (6). Odd columns separate weight of host into if host's partner has no PTA with USA or if host's partner country has a PTA with US. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

The results in Table 3.4 confirm that the market potential of a host country i plays a significant role in attracting each type of FDI from U.S. multinationals. Next, we examine whether the type of PTAs (FTAs or CUs) matters in determining the U.S. multinationals' FDI activities in a host country. We consider the market potential related to the formation of FTAs and CUs separately in Table 3.5. The results are similar to the ones shown in Table 3.4. The results in columns (1) and (2) show that weight of U.S. has the expected positive and statistically significant effects on vertical FDI, while the estimated coefficient of weight of host (FTA) is positive and significant only if the preferential partners do not have a PTA with the U.S.

As for horizontal FDI, the estimated coefficients of all of the variables that consist of the market potential in column (3) have the expected positive and significant results. Especially, both of the estimated coefficients of weight of host (FTA) and weight of host (CUs) in column (3) are positive and significant. Importantly, while the coefficient for FTA is larger than the coefficient for CUs, the economic effect of the formation of CUs involving the host country in its market potential is larger than the effects generated by the formation of FTAs. This finding is true because the estimated coefficient of 3.097 on the variable weight of host (FTA) implies that an increase of one standard deviation of this variable is associated with an increase of US$10.89 billion (3.097 multiplied by 3516.069) in the U.S. multinational firms' horizontal FDI. In comparison, the estimated coefficient of 2.460 on the variable weight of host (CUs) implies that a one-standard-deviation increase of this variable yields an associated increase of US$16.61 billion (2.460 multiplied by 6752.3) in the U.S. multinational firms' horizontal FDI.

The specification used in column (4) splits the effects of the weight of host into two components based on the existence of PTA between the U.S. and host country i's preferential partners. The positive and significant estimated coefficient of weight of host (FTA) (j has no PTA with U.S.) shows that a host country can attract horizontal FDI from the U.S. only if its preferential partners do not have a PTA with the U.S. The negative and significant estimated coefficient of weight of host (FTA) (j has PTA with U.S.) shows that the formation of FTA with country j reduces the U.S. multinationals' horizontal FDI into a host country if its preferential partners do have a PTA with the U.S. From the results in columns (3) and (4), we confirm that a host country forming CUs tends to face larger volumes of multinational activities, which seek access to local markets than one forming FTAs. Furthermore, the formation of an FTA between the host country and trade partners promotes horizontal FDI only if the partner countries do not have an FTA in place with the U.S.

In columns (5) and (6), we consider the effects of the market potential of a host country on export-platform FDI. The results in column (5) show that the estimated coefficients of weight of host (FTA) and weight of host (CUs) are both positive and statistically significant. Also, the estimated coefficient of 8.657 on the variable weight of host (FTA) implies that an increase of one standard deviation of this variable is associated with an increase of US$30.44 billion (8.657 multiplied by 3516.069) in the U.S. multinational firms' export-platform FDI. In comparison, the estimated coefficient of 5.236 on the variable weight of host (CUs) implies that a one-standard-deviation increase of this variable yields an associated increase of US$35.36 billion (5.236 multiplied by 6752.3) in the U.S. multinational firms' export-platform FDI. These results confirm that a host country forming CUs attract export-platform FDI from U.S. multinationals more than the one forming FTAs. The results in column (6) additionally show that a host country can attract more export-platform FDI from U.S. multinationals only if its preferential partners do not have a PTA with the U.S. This finding suggests that the formation of CUs can promote export-platform FDI more than the formation of FTAs, which can be explained by the tariff complementarity effects.

Table 3.5: Level regressions with different types of PTAs

VARIABLES	(1) vertical FDI	(2) vertical FDI	(3) horizontal FDI	(4) horizontal FDI	(5) export-platform FDI	(6) export-platform FDI
host country i GDP per capita	0.359***	0.363***	0.888***	0.909***	1.188***	1.198***
	(0.051)	(0.051)	(0.137)	(0.138)	(0.201)	(0.199)
corporate tax	-320.460***	-312.963***	-654.237**	-608.319**	-440.549***	-418.939***
	(71.128)	(69.978)	(275.741)	(273.087)	(158.413)	(157.981)
host GDP	0.002***	0.002***	0.038***	0.037***	0.005***	0.005***
	(0.000)	(0.000)	(0.004)	(0.004)	(0.001)	(0.001)
weight of U.S.	6.847***	6.765***	20.421***	19.920***	1.015***	0.779**
	(0.550)	(0.548)	(2.189)	(2.177)	(0.341)	(0.363)
weight of host (FTA)	0.310		3.097***		8.657***	
	(0.199)		(0.827)		(0.685)	
j has no PTA with U.S.		0.346*		3.314***		8.759***
		(0.195)		(0.821)		(0.683)
j has PTA with U.S.		-3.761		-21.835***		-3.077
		(2.295)		(7.416)		(7.176)
weight of host (CUs)	0.014	0.035	2.460***	2.586***	5.236***	5.296***
	(0.165)	(0.162)	(0.745)	(0.742)	(0.489)	(0.489)
weight of ROW	0.619***	0.478**	3.472***	2.607***	3.668***	3.261***
	(0.213)	(0.227)	(0.900)	(0.951)	(0.821)	(0.866)
Observations	1,290	1,290	1,290	1,290	1,290	1,290
R-squared	0.876	0.876	0.871	0.872	0.799	0.799
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Host country i fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of host country i	43	43	43	43	43	43

[a] Dependent variable: Total U.S. multinational vertical FDI in columns (1) and (2). Total U.S. multinational horizontal FDI in columns (3) and (4). Total U.S. multinational export-platform FDI in columns (5) and (6). All of the columns consider the market potential of host country i related to the formation of FTAs and CUs separately. Odd columns separate weight of host into if host's partner has no PTA with US or if host's partner country has a PTA with US. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

Next, the effects of the market potential on the intensive and extensive margins of each type of FDI are investigated. Columns (1) - (6) of Table 3.6 report estimates of the effects of market potential on the intensive and extensive margins of each type of FDI activities, including vertical, horizontal, and export-platform FDI. In all of the specifications, we split weight of host into two parts based on the existence of PTA between the U.S. and the host country's preferential partners. Notice that the dependent variable follows the specifications (3.10) and (3.11) to decompose each type of the FDI into the intensive and extensive margins. As a result, the number of observations is reduced to 1,247 because the observations for the year 1983 are used to calculate the intensive and extensive margins of each type of FDI for the year 1984.

The results in Table 3.6 are mostly similar to the ones in Table 3.4. Column (1) reports the effects of market potential on the intensive margin of vertical FDI, and the estimated coefficients of host GDP and weight of U.S. are economically and statistically significant. Column (2) shows that the effects of weight of U.S. continue to be economically and statistically significant on the extensive margin of vertical FDI. This suggests that the existence of preferential access between the U.S. and a host country increases vertical FDI in the host country through both intensive and extensive margins.

Column (3) reports the effects of market potential on the intensive margin of horizontal FDI. The estimated coefficients are similar to the ones in Table 3.4. In particular, PTA formation between a host country and its trade partners (i.e., weight of host) promotes horizontal FDI only if the preferential partners do not have a PTA with the U.S. We also find that PTA formation between a host country and its trade partners reduces horizontal FDI if the preferential partners do have a PTA with the U.S. The results in column (4) show that the effects of weight of host on the extensive margin of horizontal FDI are statistically insignificant.

Furthermore, columns (5) and (6) show that the effects of weight of host on the intensive and extensive margins of export-platform FDI, respectively. The results show that PTA formation between a host country and its trade partners promotes both intensive and extensive margins of export-platform FDI only if the preferential partners do not have a PTA with the U.S.

Importantly, Table 3.6 shows that the effects of market potential on the intensive margin are always greater than those on the extensive margin. These results indicate that the U.S. multinational firms expand their FDI activities in a host country more intensively through the existing FDI activities (i.e., intensive margin of FDI) rather than through establishing new affiliate firms in new industries in which they had not previously invested in (i.e., extensive margin of FDI). However, the insignificant effects of weight of host on the extensive margin of horizontal FDI may be due to the limitation of the U.S. affiliate sales dataset, which only contains nine industries. Unfortunately, there is currently no other publicly available dataset that provides more detailed sector level information about the U.S. multinational foreign affiliate sales.

Overall, the results in Tables 3.4 - 3.6 are in line with the results of Hiraide, Shen, and Silva (2020). They show that the host country's enlargement of preferential markets through PTAs promotes FDI and that the formation of CUs tends to promote total FDI inflows more than the formation of FTAs. They also find that the effects of intensive margin are larger than the effects of extensive margin and that interdependence of PTAs matters in determining total FDI inflows. We additionally find that the enlargement of the market potential of a host country through the formation of PTA with the U.S. promotes vertical FDI into a host country, and the enlargement of the market potential of a host country through the formation PTAs with other economic partners promotes horizontal and export-platform FDI. Also, we find that the effects of the formation of PTAs on horizontal FDI and export-platform FDI are both driven by the preferential markets to which a country has access and that have not established a PTA with the FDI-origination (i.e., the U.S.) country.

Table 3.6: Intensive and extensive margins of types of the U.S. affiliate sales (PTA with US or not)

VARIABLES	(1) int vFDI	(2) ext vFDI	(3) int hFDI	(4) ext hFDI	(5) int expFDI	(6) ext expFDI
host country i GDP per capita	0.344***	0.018*	0.885***	0.013	0.984***	0.066**
	(0.049)	(0.009)	(0.144)	(0.023)	(0.183)	(0.028)
corporate tax	-299.514***	-13.806	-654.061**	29.790	-384.934**	-32.259
	(70.127)	(15.556)	(280.394)	(56.214)	(156.179)	(39.230)
host GDP	0.002***	-0.000	0.037***	0.000	0.006***	-0.000
	(0.000)	(0.000)	(0.004)	(0.000)	(0.001)	(0.000)
weight of U.S.	6.465***	0.286**	19.464***	0.805*	1.582***	0.227**
	(0.597)	(0.143)	(2.343)	(0.415)	(0.411)	(0.091)
weight of host						
j has no PTA with U.S.	-0.032	0.014	2.429***	0.014	4.849***	0.395***
	(0.172)	(0.022)	(0.796)	(0.099)	(0.535)	(0.128)
j has PTA with U.S.	-3.386	-0.050	-21.754***	0.889	-2.003	2.075
	(2.462)	(0.409)	(7.786)	(1.554)	(6.991)	(1.536)
weight of ROW	0.343	0.020	2.466**	0.021	2.161**	0.166
	(0.232)	(0.039)	(1.014)	(0.182)	(0.952)	(0.149)
Observations	1,247	1,247	1,247	1,247	1,247	1,247
R-squared	0.868	0.237	0.868	0.295	0.770	0.360
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Host country i fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of host country$i$	43	43	43	43	43	43

[a] Dependent variable: Intensive and extensive margins of each type of U.S. foreign affiliate sales in odd and even numbers of columns, respectively. All of the columns separate weight of host into if host's partner has no PTA with US or if host's partner country has a PTA with US. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

3.5 Robustness tests

Table 3.7 reports the effects of the market potential on the FDI margins, while controlling for the type of PTA. The results are similar to the ones shown in Table 3.6. Overall, the effects of the intensive margin are always larger than the effects on the extensive margin. The estimated coefficients of weight of U.S. on the intensive and extensive margins of vertical FDI are both positive and significant in columns (1) and (2), respectively.

Also, column (3) confirms that the market potential enlargement through the formation of FTA with other economic partners (i.e., weight of host (FTA)) increases horizontal FDI if the preferential partners do not have a PTA with the U.S., while weight of host (FTA) decreases horizontal FDI if the preferential partners have a PTA with the U.S. The results in column (4) show that the effects of market potential on the extensive margin of horizontal FDI are insignificant. In column (3), a one-standard-deviation increase in the variable weight of host (FTA) (j has no PTA with U.S.) is associated with an increase of US\$10.87 billion (3.108×3497.065) in the U.S. multinational firms' horizontal FDI through intensive margin. On the other hand, a one-standard-deviation increase in the variable weight of host (FTA) (j has PTA with U.S.) is associated with a decrease of US\$2.71 billion (-22.455×120.818) in the U.S. multinational firms' horizontal FDI through intensive margin. In comparison, a one-standard-deviation increase in the variable weight of host (CUs) is associated with an increase of US\$16.71 billion (2.474×6752.3) in the U.S. multinational firms' horizontal FDI through intensive margin. Therefore, the formation of CUs promotes the intensive margin of horizontal FDI more than the formation of FTAs.

Columns (5) and (6) report the effects of weight of host on export-platform FDI. The results in column (5) show that the estimated coefficient of weight of host (FTA) is positive and significant only if the preferential partners do not have a PTA with the U.S. Also, the estimated coefficient of weight of host (CUs) is positive and significant. The estimated coefficient of 5.067 on the variable weight of host (CUs) implies that an increase of one standard deviation of this variable is associated with an increase of US\$34.21 billion in the U.S. multinational firms' export-platform FDI. In comparison, the estimated coefficient of

8.160 on the variable weight of host (FTA) (j has not PTA with U.S.) implies that a one-standard-deviation increase of this variable yields an associated increase of US$28.54 billion in the U.S. multinational firms' export-platform FDI. Thus, we find that the formation of CUs promotes export-platform FDI more than the formation of FTA does through intensive margin.

Lastly, the results in column (6) show that the estimated coefficients of weight of host (FTA) are positive and significant only if the preferential partners do not have a PTA with the U.S. Also, the estimated coefficient of weight of host (CUs) is positive and significant. The estimated coefficient of 0.422 on the variable weight of host (CUs) implies that an increase of one standard deviation of this variable is associated with an increase of US$2.85 billion in the U.S. multinational firms' export-platform FDI. In comparison, the estimated coefficient of 0.818 on the variable weight of host (FTA) (j has not PTA with U.S.) implies that a one-standard-deviation increase of this variable yields an associated increase of US$2.86 billion in the U.S. multinational firms' export-platform FDI. The results in column (6) suggest that both the formation of FTAs and the formation of CUs increase the extensive margin of export-platform FDI roughly at the same level.

Table 3.7: Intensive and extensive margins of types of the U.S. affiliate sales with different types of PTAs (PTA with US or not)[a]

VARIABLES	(1) int vFDI	(2) ext vFDI	(3) int hFDI	(4) ext hFDI	(5) int expFDI	(6) ext expFDI
host country i GDP per capita	0.365***	0.020**	0.930***	0.021	1.203***	0.094***
	(0.051)	(0.010)	(0.147)	(0.023)	(0.197)	(0.031)
corporate tax	-295.945***	-13.530	-646.427**	31.154	-347.728**	-27.505
	(70.271)	(15.545)	(281.755)	(56.272)	(153.666)	(39.074)
host GDP	0.002***	-0.000	0.037***	0.000	0.005***	-0.000
	(0.000)	(0.000)	(0.004)	(0.000)	(0.001)	(0.000)
weight of U.S.	6.382***	0.280*	19.288***	0.773*	0.723**	0.118
	(0.608)	(0.143)	(2.376)	(0.415)	(0.359)	(0.079)
weight of host (FTA)						
j has no PTA with U.S.	0.286	0.038	3.108***	0.135	8.160***	0.818***
	(0.208)	(0.026)	(0.887)	(0.107)	(0.655)	(0.193)
j has PTA with U.S.	-3.714	-0.075	-22.455***	0.764	-5.419	1.639
	(2.368)	(0.411)	(7.713)	(1.539)	(6.618)	(1.453)
weight of host (CUs)	-0.011	0.015	2.474***	0.022	5.067***	0.422***
	(0.173)	(0.022)	(0.802)	(0.099)	(0.487)	(0.126)
weight of ROW	0.419*	0.025	2.630**	0.050	2.957***	0.268*
	(0.238)	(0.039)	(1.021)	(0.182)	(0.882)	(0.153)
Observations	1,247	1,247	1,247	1,247	1,247	1,247
R-squared	0.869	0.237	0.868	0.297	0.796	0.385
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Host country i fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of host country i	43	43	43	43	43	43

[a] Dependent variable: Intensive and extensive margins of each type of U.S. foreign affiliate sales in odd and even numbers of columns, respectively. All of the columns separate weight of host into if host's partner has no PTA with US or if host's partner country has a PTA with US. Also, all of the columns consider the market potential of host country i related to the formation of FTAs and CUs separately. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Standard errors are clustered at home-host country level.

Table 3.8 considers an alternative econometric approach based on the first differencing of the data over five years to account for the full impact of PTAs on each type of FDI inflows. In columns (1) and (2), the coefficients of the variables $\Delta_5$host country i GDP and $\Delta_5$weight of U.S. are positive and statistically significant at the 99 percent significance level. The coefficient of the variable $\Delta_5$weight of host continues to be statistically insignificant. Similarly, the results in column (2) show that the existence of PTA between the U.S. and a host country i's preferential partners has no effect on vertical FDI into a host country i. In columns (3) and (4), all of the coefficients have their expected signs, although the coefficients of $\Delta_5$weight of host in column (3) and $\Delta_5$weight of host (j has no PTA with U.S.) in column (4) are positive and statistically significant at the 90 percent significance level. In columns (5) and (6), we confirm that a host country can attract a larger export-platform FDI by forming PTAs with trade partners only if those partners do not have a PTA with the U.S.

Table 3.8: First differencing over 5 years with each type of U.S. FDI[a]

VARIABLES	(1) $\Delta_5$vertical FDI	(2) $\Delta_5$vertical FDI	(3) $\Delta_5$horizontal FDI	(4) $\Delta_5$horizontal FDI	(5) $\Delta_5$export-platform FDI	(6) $\Delta_5$export-platform FDI
$\Delta_5$host GDP per capita	0.290***	0.291***	0.565***	0.578***	0.579***	0.583***
	(0.065)	(0.064)	(0.150)	(0.152)	(0.148)	(0.148)
$\Delta_5$corporate tax	-33.529	-31.581	-256.958	-240.617	-70.740	-66.054
	(48.437)	(48.494)	(193.187)	(191.125)	(113.450)	(113.345)
$\Delta_5$host country i GDP	0.002***	0.002***	0.035***	0.035***	0.003***	0.003***
	(0.000)	(0.000)	(0.003)	(0.003)	(0.001)	(0.001)
$\Delta_5$weight of U.S.	3.125***	3.102***	8.031***	7.838***	1.684***	1.629***
	(0.359)	(0.355)	(1.760)	(1.747)	(0.562)	(0.584)
$\Delta_5$weight of host	-0.279		1.500*		5.321***	
	(0.212)		(0.894)		(0.596)	
j has no PTA with U.S.		-0.269		1.584*		5.345***
		(0.211)		(0.886)		(0.598)
j has PTA with U.S.		-2.593		-17.912***		-0.246
		(2.538)		(6.823)		(6.309)
$\Delta_5$weight of ROW	-0.140	-0.206	1.133	0.581	3.710***	3.551***
	(0.230)	(0.236)	(0.964)	(1.014)	(0.860)	(0.860)
Observations	1,075	1,075	1,075	1,075	1,075	1,075
R-squared	0.178	0.179	0.273	0.276	0.265	0.265
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

[a] Dependent variable: First difference of the U.S. multinational vertical FDI over 5 years in columns (1) and (2). First difference of the U.S. multinational horizontal FDI over 5 years in columns (3) and (4). First difference of the U.S. multinational export-platform FDI over 5 years in columns (5) and (6). All of the columns separate weight of host into if host's partner has no PTA with US or if host's partner country has a PTA with US. Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

In Table 3.8, we consider an alternative econometric approach based on the first differencing of the data over five years. However, the concern about the endogeneity of the decision to form a PTA and activities of multinational firms may still exist. We account for this potential simultaneity by employing an IV method to correct for the potential endogeneity bias of PTA formation using the method outlined in Hiraide, Shen, and Silva (2020).

Columns (1) - (6) of Table 3.9 show the estimation results using the predicted market potential variable based on probit and linear probability models in odd and even numbers of columns, respectively. In columns (1) and (2), the instrumented weight of U.S. and weight of host exhibit positive and significant effects on vertical FDI even after controlling for the potential simultaneity between host country i's PTA status and U.S. foreign affiliate sales. The results in columns (3) and (4) show that the estimated coefficients of weight of host are positive and significant. Similarly, the results in columns (5) and (6) confirm that the economic integration between a host country and its trade partners through the formation of PTAs (i.e., weight of host) increases export-platform FDI from U.S. multinationals.

Table 3.9: Addressing potential endogeneity of PTA: 2SLS estimates[a]

VARIABLES	(1) vFDI (probit)	(2) vFDI (LPM)	(3) hFDI (probit)	(4) hFDI (LPM)	(5) expFDI (probit)	(6) expFDI (LPM)
host country i GDP per capita	0.241***	0.221***	-0.785**	-0.152	0.607***	0.714***
	(0.076)	(0.053)	(0.383)	(0.203)	(0.206)	(0.270)
corporate tax	-119.646	-175.889**	1,538.824***	488.151	-35.033	-122.827
	(87.080)	(69.329)	(515.559)	(322.014)	(218.530)	(282.201)
host GDP	0.004***	0.003***	0.049***	0.043***	0.008***	0.008***
	(0.001)	(0.000)	(0.006)	(0.004)	(0.002)	(0.001)
weight of U.S.	11.903***	11.524***	84.286***	44.931***	10.919***	5.909
	(1.842)	(1.154)	(15.187)	(5.486)	(3.985)	(8.698)
weight of host	1.298***	1.446***	22.529***	14.164***	9.251***	7.959***
	(0.468)	(0.312)	(3.510)	(2.138)	(1.148)	(2.380)
weight of ROW	-2.334**	1.228**	4.526	7.843**	3.352	0.258
	(1.065)	(0.588)	(9.958)	(3.883)	(2.720)	(3.312)
Observations	1,290	1,290	1,290	1,290	1,290	1,290
R-squared	0.762	0.836	0.452	0.799	0.719	0.734
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Host country i fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of host country i	43	43	43	43	43	43

[a] Dependent variable: U.S. multinational vertical FDI in columns (1) and (2). U.S. multinational horizontal FDI in columns (3) and (4). U.S. multinational export-platform FDI in columns (5) and (6). Superscripts "***", "**" and "*" represent statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in the parentheses.

3.6 Conclusion

This paper investigates the effects of PTAs on U.S. multinationals' FDI activities, including vertical, horizontal, and export-platform FDI, by considering the market potential of a host country, which takes into account both a PTA between a host country and the home country and PTAs between the host and other economic partners. Based on the U.S. multinational foreign affiliate sales data provided by the BEA, we find that a host country enlarging preferential markets through the formation of PTAs with other economic partners increases horizontal and export-platform FDI inflows from the U.S. Also, a host country that formed a PTA with the U.S. receives a larger amount of vertical FDI. Importantly, the effects of the formation of PTAs on horizontal FDI and export-platform FDI are driven by the preferential markets to which a country has access and that have not established a PTA with the FDI-origination (i.e., U.S.) country. These results show that interdependence of PTAs matters if we consider the effects of PTAs on horizontal FDI and export-platform FDI.

Moreover, we examine the effects of PTAs on each type of FDI by controlling for the different levels of heterogeneity, including the types of PTAs (FTAs or CUs) and the margins of FDI (intensive or extensive). We find that the formation of CUs tends to promote horizontal and export-platform FDI more than the formation of FTAs. We also find that the intensive margin effects are always larger than the effects on the extensive margin for all types of FDI. Our results are robust to other specifications shown in 3.7 - 3.9.

Bibliography

[1] Baier, Scott L., Bergstrand, Jeffrey H., 2007. Do free trade agreements increase members' international trade? Journal of International Economics 71, 72-95.

[2] Baier, Scott L., Bergstrand, Jeffrey H., Feng, Michael, 2014. Economics integration agreements and the margins of international trade. Journal of International Economics 93, 339-350.

[3] Baltagi, Badi H., Peter Egger, and Michael Pfaffermayr. 2008. Estimating Regional Trade Agreement Effects on FDI in an Interdependent World. Journal of Econometrics 145 (1): 194-208.

[4] Blanchard, Emily, Matschke, Xenia, 2015. U.S. multinationals and preferential market access. The Review of Economics and Statistics 97(4), 839-854

[5] Chen, Maggie X., 2009. Regional economic integration and geographic concentration of multinational firms. European Economic Review 53(3), 355-375.

[6] Deltas, George, Desmet, Klaus, Facchini, Giovanni, 2012. Hub-and-spoke free trade areas: theory and evidence from Israel. Canadian Journal of Economics 12, 942-977.

[7] Egger, Peter, Larch, Mario, 2008. Interdependent preferential trade agreement memberships: An empirical analysis. Journal of International Economics, 76, 384-399.

[8] Ekholm, Karolina, Rikard Forslid, and James R. Markusen. 2007. Export-Platform Foreign Direct Investment. Journal of the European Economic Association 5 (4): 776-95.

[9] Grossman, Gene M., Helpman, Elhanan., Szeidl, Adam., 2006. Optimal integration strategies for the multinational firm. Journal of International Economics 70, 216-238.

[10] Hanson, Gordon H., Jr Mataloni Raymond J, and Matthew J. Slaughter. 2001. Expansion Strategies of U.S. Multinational Firms. National Bureau of Economic Research Working Paper #8433.

[11] Harris, Chauncy D., 1954. The Market as a Factor in the Localization of Industry in the United States. Annals of the Association of American Geographers 44(4), 315-348.

[12] Head, Keith, Mayer, Thierry, 2003. The empirics of Agglomeration and Trade. CEPII, Working Paper No 2003-15

[13] Helpman, Elhanan., 1984. A simple theory of international trade with multinational corporations. Journal of Political Economy 92, 451-472.

[14] Helpman, Elhanan., Melitz, Marc., Yeaple, Stephen., 2004. Export versus FDI with heterogeneous firms. American Economic Review 94, 300-316.

[15] Hiraide, Norikatsu, Leilei Shen and Peri da Silva, 2020. The Importance of Heterogeneity in Determining the Effects of Preferential Trade Agreements on FDI. The World Economy, Forthcoming.

[16] Hummels, David, Klenow, Peter J., 2005. The variety and quality of a nation's exports. American Economic Review 95, 704-723.

[17] Markusen, James R., 1984. Multinationals, multi-plant economies, and the gains from trade. Journal of International Economics 16, 205-226.

[18] Markusen, James R., Anthony J. Venables, Denise Eby Konan, and Kevin H. Zhang. 1996. A Unified Treatment of Horizontal Direct Investment, Vertical Direct Investment, and the Pattern of Trade in Goods and Services. National Bureau of Economic Research Working Paper #5696.

[19] Wooldridge, Jeffrey M., 2000. Introductory Econometrics. South-Western, Chicago, IL.

[20] Wooldridge, Jeffrey M., 2010. Econometric Analysis of Cross Section and Panel Data, Second edition. MIT Press, Cambridge, MA.