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The Impact of Restrictions on Mode 3 International Supply of Services

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Abstract

We estimate an econometric model that links the value of U.S. foreign affiliate sales of services in 46 countries to World Bank measures of mode 3 services trade restrictions. The econometric analysis indicates that eliminating existing restrictions on mode 3 supply would increase foreign affiliate sales by 73.72 percent on average across the countries, while eliminating existing restrictions on mode 1 supply would reduce foreign affiliate sales of services by 24.19 percent on average, due to switching between the two modes of international supply.

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1. Introduction

The General Agreement on Trade in Services recognizes four modes in the international supply of services. Mode 3 is defined as services supplied by a provider in one country, through a foreign commercial presence, in the territory of another country.[2] Services provided outside of the United States by affiliates of U.S.-parented multinationals are examples of mode 3 sales.

According to Grimm and Krishnan (2014), services supplied by the United States through foreign affiliates were twice as large as services supplied by the United States through cross-border exports in 2012.[3] The value of services supplied through foreign affiliates grew from $1.247 trillion in 2011 to $1.293 trillion in 2012. Still, despite the continued growth in these mode 3 sales, significant barriers to establishing and operating foreign affiliates remain in many countries.

There have been significant recent advances in measuring these barriers. The World Bank's Services Trade Restrictions database reports restrictions for each mode of supply on a detailed basis and on an aggregated basis for 103 advanced and developing countries.[4] The World Bank's aggregated measure for each country is called the Services Trade Restrictions Index (STRI). The mode 3 barriers in the database include restrictions on foreign ownership, licensing, and operations.

In this paper, we estimate an econometric model that links the value of U.S. foreign affiliate sales of services in 46 countries to the World Bank's measures of mode 3 services trade restrictions. Then we use the econometric model to estimate how much larger U.S. mode 3 sales would be if existing services trade restrictions were reduced or eliminated entirely. Section 2 provides the theoretical framework for our analysis. It is an application of the model of foreign affiliates and exporting in Helpman, Melitz, and Yeaple (2004) to international trade in services. The theoretical model demonstrates that foreign affiliate sales are affected not only by restrictions on mode 3 supply but also by restrictions on mode 1 supply if the two modes are viable alternatives for serving the same foreign markets.

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[2] Borchert, Gootiiz, and Mattoo (2013) describe the four different modes of international supply. Mode 1 refers to cross-border trade in services. Mode 2 involves a resident of one country consuming services in another country, for example as an international tourist or student. Mode 4 is service provision through the presence of natural citizens.

[3] Table A in Grimm and Krishnan (2014) indicates that services supplied through trade were $0.687 trillion in 2012, and services supplied through foreign affiliates of U.S. companies were $1.293 trillion in the same year.

[4] Borchert, Gootiiz, and Mattoo (2013) provide a detailed explanation of the dataset.

Our empirical analysis supports the model's qualitative predictions and also provides estimates of the magnitudes of the effects on foreign affiliate sales. Section 3 discusses our econometric specification and the data that we use to estimate the model. Section 4 reports our parameter estimates, and Section 5 presents a set of counterfactual calculations. Section 6 provides conclusions and directions for further research.

2. Theoretical Framework

Before presenting the empirical analysis, we provide a theoretical framework that applies the model in Helpman, Melitz, and Yeaple (2004) to international trade in services. After introducing the assumptions of the "HMY" model, we derive the predicted changes in foreign affiliate sales that would result from the reduction or complete elimination of the services trade restrictions.

2.1 The HMY Model

Helpman, Melitz, and Yeaple (2004) develop a theoretical model that shows how foreign affiliate sales respond to barriers at the border and beyond the border.[5] The HMY model builds on the model of trade with firm heterogeneity in Melitz (2003), merging it with the literature on multinationals surveyed in Markusen (2002). The HMY model is well-suited for analyzing the impact of services trade restrictions, though Helpman, Melitz, and Yeaple do not specifically apply the model to services.[6] In this section, we summarize the HMY model, with an emphasis on how services trade restrictions can be represented in the model and with some adaptations of the model to better fit our empirical analysis.

In the HMY model, there is a homogeneous goods sector and a differentiated goods sector; we add differentiated services sectors to the model. All of the sectors have constant expenditure shares in consumer preferences. We focus our exposition on one of the differentiated services sectors and omit the subscripts for the sectors to simplify the notation. The expenditure share of the sector in foreign market j is β_j.

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[5] Helpman, Melitz, and Yeaple (2003) is a more extensive working paper version of the study that provides more detailed explanations of the model and more variations on the modeling assumptions.

[6] Their empirical analysis is limited to foreign affiliates of manufacturing firms.

Consumers have CES preferences across the varieties of the differentiated services within the sector. Equation (1) is the demand function for a variety with price p in market j.[7]

$$q_j = A_j \, p^{1-\varepsilon} \tag{1}$$

The term A_j is a function of aggregate expenditures in market j (E_j), the expenditure share of the differentiated products sector (β_j), the sector's CES price index in market j (P_j), and the constant elasticity of substitution (ε).[8]

$$A_j = \beta_j \, E_j \, P_j^{\varepsilon-1} \tag{2}$$

There is monopolistic competition in the sector. In equilibrium, there is a continuum of varieties produced by a continuum of firms. Each producer takes the sector price index, aggregate expenditures, and the sector's expenditure share as given when setting its own price. The firm's profit-maximizing price is characterized by a fixed mark-up over its marginal cost mc.

$$p = \left(\frac{\varepsilon}{\varepsilon-1}\right) mc \tag{3}$$

The firm decides whether to serve foreign market j through cross-border exports (mode 1 supply) or foreign affiliate sales (mode 3 supply). There are incremental costs associated with each of the modes of supply. If the firm exports to foreign market j, then it incurs an additional fixed trade cost f_{Xj} (measured in labor units) and faces an ad valorem variable trade cost factor τ_j. The variable f_{Xj} represents non-tariff restrictions on the mode 1 supply of services. If the firm provides the services through a foreign affiliate in market j, then it incurs an additional fixed cost f_{Ij} (also measured in labor units) but no fixed or variable trade costs. The variable f_{Ij} represents restrictions on the mode 3 supply of services. The firm faces an economic tradeoff between proximity and scale: if it exports the services across borders, then it can achieve economies of scale by avoiding duplicative fixed costs in each of the national markets that it serves, though it incurs trade costs.

Labor in the only factor of production in the HMY model. Each firm's marginal cost of production is equal to the product of its unit labor requirement a and the wage in the country where the service

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is produced. In the HMY model, the wage is the same in all countries and is set equal to one.[9] Therefore, $mc = a$. The firms vary in their labor productivity, which is simply $1/a$. The distribution of the firms in the sector is represented by the continuous and differentiable cumulative distribution function $G(a)$.

The HMY model focuses on firms that serve their domestic market and are considering whether to also serve foreign market j. If a firm with unit labor requirement a exports to foreign market j, then it earns additional profit $\pi_X^j(a)$.

$$\pi_X^j(a) = A_j \left(\frac{\varepsilon}{\varepsilon-1}\right)^{1-\varepsilon} \frac{1}{\varepsilon} (\tau_j \, a)^{1-\varepsilon} - f_{Xj} \tag{4}$$

If the firm serves market j through a foreign affiliate in foreign market j, then it earns additional profit $\pi_I^j(a)$ instead.

$$\pi_I^j(a) = A_j \left(\frac{\varepsilon}{\varepsilon-1}\right)^{1-\varepsilon} \frac{1}{\varepsilon} (a)^{1-\varepsilon} - f_{Ij} \tag{5}$$

The HMY model imposes additional restrictions on the parameter values: it assumes that $f_{Ij} - f_{Xj}$ is large enough that only the most productive firms (those with the lowest value of a) serve market j by establishing a foreign affiliate, the firms with productivity in a middle range serve market j through cross-border exports, and the least productive firms do not serve foreign market j at all.[10]

Equations (4) and (5) define a cutoff unit labor requirement a_I^j such that $\pi_X^j(a_I^j) = \pi_I^j(a_I^j)$.

$$a_I^j = \left(\frac{\varepsilon-1}{\varepsilon}\right) \left((f_{Ij} - f_{Xj}) \left[1 - (\tau_j)^{1-\varepsilon}\right] \frac{A_j}{\varepsilon}\right)^{\frac{1}{\varepsilon-1}} \tag{6}$$

A firm with $a = a_I^j$ is indifferent between the two modes of supplying services to foreign market j. If the firm's unit labor requirement is less than a_I^j, then it will be more profitable for the firm to serve the market through a foreign affiliate. If the firm's unit labor requirement is greater than a_I^j, then it will be more profitable for the firm to serve market j through cross-border exports.

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[9] This follows from the model's assumptions that there are constant returns to scale and no fixed costs of production in the sector that produces homogeneous goods, and there is costless international trade in the homogeneous goods that completely arbitrages prices. Under this set of assumptions, each sector can be modeled in isolation.

[10] This particular "pecking order" in productivities has been confirmed in a large empirical literature that followed Helpman, Melitz, and Yeaple (2004), as we discuss below.

Equation (7) is the value of U.S. foreign affiliate sales in the sector in foreign market j, integrated over all of the U.S.-parented multinationals that serve the market through mode 3.

$$FA_j = A_j \left(\frac{\varepsilon}{\varepsilon-1}\right)^{1-\varepsilon} V\left(a_I^j\right) \tag{7}$$

In the HMY model, $V\left(a_I^j\right) = \int_0^{a_I^j} (a)^{1-\varepsilon} \, dG(a)$. According to equation (7), foreign affiliate sales are a function of the constant elasticity of substitution, the cutoff unit labor requirement for foreign affiliate sales in market j, and the distribution of the unit labor requirements across the firms.

2.2 Empirical Studies that Support the Predictions of the HMY Model

There are several econometric studies that have tested and confirmed the predictions of the HMY model, though most do not examine services industries. The original article by Helpman, Melitz, and Yeaple finds support for the predictions of the model in firm-level data for U.S.-parented multinationals in manufacturing. Girma, Kneller, and Pisu (2005) confirm the model's prediction that there is selection in the structure of international commerce, with the most productive firms choosing foreign direct investment and the least productive firms only serving their own domestic market. They use data on manufacturing firms in the United Kingdom between 1990 and 1996. Likewise, Tomiura (2007) finds support for the model in a large sample of Japanese manufacturing firms in 1998. Yeaple (2009) uses firm-level data on U.S. multinationals in manufacturing in 1994 to test several of the predictions of an extended version of the HMY model, including the "pecking order" of the firms' productivities. He finds that more productive U.S. firms generally own affiliates in a larger number of countries and generate more sales in each of the countries. Engel and Procher (2012) report an econometric analysis of productivity levels in 110,000 French firms in 2004. They confirm the findings of the earlier studies: multinationals are more productive. They separately test the HMY model's predictions by sector, and they find that the predictions specifically hold for the services sectors.

2.3 Comparative Statics for Traded Services

Next, we calculate the partial derivatives of FA_j in equation (7) to determine the effects of the mode-specific services trade restrictions, variable costs of exporting, the aggregate expenditure level in foreign market j, and the sector's expenditure share on the sector's foreign affiliate sales of services. Equation (8) is the effect of a change in the fixed costs of establishing and operating a foreign affiliate in foreign market j, f_{Ij}, which represents the mode 3 restrictions.

$$\frac{dFA_j}{df_{Ij}} = \left(\frac{\partial FA_j}{\partial A_j}\frac{\partial A_j}{\partial P_j}\frac{\partial P_j}{\partial f_{Ij}}\right) + \left(\frac{\partial FA_j}{\partial V_j}\frac{\partial V_j}{\partial a_I^j}\frac{\partial a_I^j}{\partial f_{Ij}}\right) + \left(\frac{\partial FA_j}{\partial V_j}\frac{\partial V_j}{\partial a_I^j}\frac{\partial a_I^j}{\partial A_j}\frac{\partial A_j}{\partial P_j}\frac{\partial P_j}{\partial f_{Ij}}\right) \qquad (8)$$

In general, the sign of dFA_j/df_{Ij} is ambiguous. We know from equation (6) that $\partial a_I^j/df_{Ij} < 0$ and $\partial a_I^j/dA_j < 0$. We know from equation (7) and the definition of V_j that $\partial FA_j/\partial V_j > 0$ and $\partial V_j/\partial a_I^j > 0$. Therefore, the second term in parentheses in equation (8) is negative. We know from equation (2) that $\partial A_j/\partial P_j > 0$. We also know from equation (7) and the definition of V_j that $\partial FA_j/\partial A_j > 0$. Therefore, the first and third terms in parentheses are positive, since $\partial P_j/\partial f_{Ij} > 0$. An increase in the mode 3 restrictions reduces the number of foreign firms serving market j through affiliates, as they switch to exporting. Since exporting has a higher marginal cost in the model, this increases the sector price index P_j. If the share of foreign affiliates is small, then $\partial P_j/\partial f_{Ij}$ is small, the first and third terms in equation (8) disappear, and the overall sign of dFA_j/df_{Ij} is negative. In this case, restrictions on mode 3 sales have a negative impact on mode 3 sales of U.S.-parented multinationals. Technically, it is possible that the overall sign of dFA_j/df_{Ij} could be positive, but it is unlikely.[11]

Equation (9) is the effect of a change in the fixed costs of exporting to foreign market j.

$$\frac{dFA_j}{df_{Xj}} = \left(\frac{\partial FA_j}{\partial A_j}\frac{\partial A_j}{\partial P_j}\frac{\partial P_j}{\partial f_{Xj}}\right) + \left(\frac{\partial FA_j}{\partial V_j}\frac{\partial V_j}{\partial a_I^j}\frac{\partial a_I^j}{\partial f_{Xj}}\right) + \left(\frac{\partial FA_j}{\partial V_j}\frac{\partial V_j}{\partial a_I^j}\frac{\partial a_I^j}{\partial A_j}\frac{\partial A_j}{\partial P_j}\frac{\partial P_j}{\partial f_{Xj}}\right) \qquad (9)$$

From equation (6), we know that $\partial a_I^j/df_{Xj} > 0$. The effect of the fixed costs of exporting on the sector price index in market j has an ambiguous sign: an increase in mode 1 restrictions leads more firms to serve the market through foreign affiliates, with lower marginal costs, and this reduces the sector price index; on the other hand, the increase in mode 1 restrictions may eliminate some foreign suppliers from market j entirely, and this increases the sector price index. As long as the share of foreign affiliates is small, the first and third terms in equation (9) disappear, then the overall sign of dFA_j/df_{Xj} is positive. The firms switch between modes of international supply.

Equation (10) is the effect of a change in the variable costs of exporting to foreign market j.

$$\frac{dFA_j}{d\tau_j} = \left(\frac{\partial FA_j}{\partial A_j}\frac{\partial A_j}{\partial P_j}\frac{\partial P_j}{\partial \tau_j}\right) + \left(\frac{\partial FA_j}{\partial V_j}\frac{\partial V_j}{\partial a_I^j}\frac{\partial a_I^j}{\partial \tau_j}\right) + \left(\frac{\partial FA_j}{\partial V_j}\frac{\partial V_j}{\partial a_I^j}\frac{\partial a_I^j}{\partial A_j}\frac{\partial A_j}{\partial P_j}\frac{\partial P_j}{\partial \tau_j}\right) \qquad (10)$$

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[11] For example, it could be positive if there were no change in the set of U.S. firms with foreign affiliate sales in market j (because there were no U.S.-parented multinationals with a right below a_I^j), but there were many foreign affiliates from third countries that are on the extensive margin, resulting in a large increase in P_j.

From equation (6), we know that $\partial a_I^j / d\partial\tau_j > 0$. Since $\partial P_j / \partial\tau_j$ is positive, the sign of $dFA_j / d\tau_j$ is likely positive, as firm substitute between modes of international supply.

Equations (11) and (12) are the effects of changes in the level of aggregate expenditures and the sector's share of these expenditures.

$$\frac{dFA_j}{dE_j} = \left(\frac{\partial FA_j}{\partial A_j}\frac{\partial A_j}{\partial E_j}\right) + \left(\frac{\partial FA_j}{\partial V_j}\frac{\partial V_j}{\partial a_I^j}\frac{\partial a_I^j}{\partial A_j}\frac{\partial A_j}{dE_j}\right) \tag{11}$$

$$\frac{dFA_j}{d\beta_j} = \left(\frac{\partial FA_j}{\partial A_j}\frac{\partial A_j}{\partial \beta_j}\right) + \left(\frac{\partial FA_j}{\partial V_j}\frac{\partial V_j}{\partial a_I^j}\frac{\partial a_I^j}{\partial A_j}\frac{\partial A_j}{d\beta_j}\right) \tag{12}$$

The signs of dFA_j / dE_j and $dFA_j / d\beta_j$ are unambiguously positive in the HMY model.

Without making additional restrictive assumptions about the distribution $G(a)$, the model gives clear predictions for the signs of some of these economic effects and ambiguous predictions for the signs of others. We attempt to resolve these ambiguities in the empirical analysis below.

2.4 Comparative Statics for Non-Traded Services and the Services Aggregate

Next, we consider the effects on foreign affiliate sales in other differentiated services sectors where the costs of exporting the services are prohibitively high and so there is no cross-border trade. Firms in non-traded services sectors decide whether to serve market j through a foreign affiliate or to not serve the foreign market at all. For these sectors, equation (13) replaces equation (6) as the cutoff unit labor requirement for foreign affiliate sales.

$$a_I^j = \left(\frac{\varepsilon-1}{\varepsilon}\right)\left(\frac{f_{Ij} A_j}{\varepsilon}\right)^{\frac{1}{\varepsilon-1}} \tag{13}$$

For these non-traded services sectors, dFA_j / df_{Xj} is zero, because inter-modal switching is never profitable.

In the empirical analysis below, we model the effects of the mode-specific services trade restrictions on aggregate U.S. foreign affiliate sales that include all sectors that provide services. The services aggregate is a combination of services that are supplied across borders and non-traded services, and so the comparative static effects for the services aggregate are *averages* of the comparative static effects for the traded services sectors and services that are not traded. Since there is no effect of mode 1 restrictions in the non-traded sectors, the magnitude of the estimated effect of mode 1 restrictions is increasing in the share of services that are traded.

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3. Empirical Methodology and Data

In the empirical analysis, we test the qualitative predictions about the model for the effects of the trade restrictions on mode 3 sales of services, and we estimate the magnitudes of these effects.

3.1. Econometric Specification

The log-linear model in equation (14) links the value of U.S. foreign affiliate sales of services to restrictions on the two modes of international services supply and to other relevant economic factors.

$$lnFAS_{jt} = \beta_0 + \beta_1 \, STR\_M3_j + \beta_2 \, STR\_M1_j + \beta_3 \, lnGDP_{jt} + \beta_4 \, lnGDPPC_{jt}$$
$$+ \beta_5 \, FTA_{jt} + \beta_6 \, ENGLISH_j + \beta_7 \, lnKM_j + \gamma_t + \varepsilon_{jt} \qquad (14)$$

The variable $lnFAS_{jt}$ is the log of the value of U.S. foreign affiliate sales of services in market j in year t, STR_M3_j is the measure of restrictions on mode 3 international services supply in foreign market j, and STR_M1_j is the measure of restrictions on mode 1 international services supply. According to the theoretical model in Section 2, restrictions on mode 3 reduce foreign affiliate sales ($\beta_1 < 0$), while restrictions on mode 1 increase foreign affiliate sales ($\beta_2 > 0$) if there is a significant share of services that can be internationally traded and there is inter-modal switching. The variable $lnGDP_{jt}$ is the log of the gross domestic product in market j in year t. This is a measure of the aggregate expenditure level in market j, the variable E_j in the theoretical model. The variable $lnGDPPC_{jt}$ is the log of the country's GDP per capita. This is a measure of economic development that affects the expenditure share of services, the variable β_j in the model. The variable FTA_{jt} is an indicator of whether country j had a free trade agreement with the United States in year t. A free trade agreement can lower fixed and variable costs of trade, but we expect that it will mostly reduce tariffs and therefore the variable trade cost factor τ_j in the model. The variable $ENGLISH_j$ is an indicator for whether country j is English-speaking like the United States. Language can affect many of the trade costs, but its main effect is probably on f_{Xj}, the fixed costs associated with cross-border exports. Based on these assumptions, we expect that $\beta_3 > 0$, $\beta_4 > 0$, $\beta_5 > 0$, and $\beta_6 > 0$. The variable $lnKM_j$ is the log of the distance in kilometers between the United States and country j. Distance increases f_{Ij}, according to Keller and Yeaple (2010), but it may also increase τ_j.[12]

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[12] Keller and Yeaple (2010) provide empirical evidence that foreign affiliate sales of U.S. parents in the manufacturing sector are decreasing in international distance. They explain that this pattern in the data reflects high international knowledge transfer costs.

Therefore, the sign of β_7 is generally ambiguous. The variable γ_t is a year fixed effect that controls for supply conditions in the parent country. These conditions are common across the observations in our dataset, since our dataset is limited to foreign affiliates of U.S.-parented multinationals, but they vary over time. Finally, ε_{jt} is the error term of the model.

3.2. Data Used in the Econometric Analysis

The econometric model utilizes data on foreign affiliate sales of services from the U.S. Bureau of Economic Analysis (BEA).[13] We focus on services supplied by affiliates in the local markets (i.e., to persons in the host country).[14] The BEA data are available on an annual basis from 2009 to 2012. Of all of the services supplied to foreign persons in 2012, 66.4 percent were supplied through foreign affiliates of U.S.-parented multinationals, and 33.6 percent were supplied through U.S. exports.[15] The BEA data includes 57 individual countries (or parts of countries, like Hong Kong), as well as several regional aggregates of countries.

Our analysis also utilizes data on restrictions from the World Bank's Services Trade Restrictions database (STRD). According to Borchert, Gootiiz, and Mattoo (2012), the World Bank database attempts to identify restrictions that discriminate against foreign suppliers of services on a most favored nation basis. They do not reflect preferential treatment under FTAs.[16] The World Bank reports STRIs for each of the four modes of international services supply. The country-level STRIs are averages across the services sectors that are covered in the STRD. The STRI values for each country range from 0 (open without restrictions) to 100 (completely closed). The World Bank constructed their measures of restrictions for the OECD countries from public data and for the non-OECD countries from responses to World Bank questionnaires.[17] The STRD includes 103 countries,

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[13] Specifically, the data are from Table 3.2 (Services Supplied to Foreign Persons by U.S. MNEs Through Their Majority-owned Foreign Affiliates, by Country of Affiliate and by Destination) in the BEA's International Services database. These data include services sales of foreign affiliates in manufacturing industries as well as services industries.

[14] According to the BEA, sales to the local market accounted for 78.5% of the value of services supplied to foreign persons by U.S. multinationals through their majority-owned foreign affiliates in 2012. This ratio is higher than the average for U.S. foreign affiliates in Canada (97.5%) and the Asia and Pacific region (83.9%) but lower than the average for Europe (71.6%) and the Latin America and Caribbean region (78.5%).

[15] Grimm and Krishnan (2014) describe the most recent data, as well as the definitions and methods used to construct the data.

[16] There is limited coverage of prudential regulation and pro-competitive regulations that do not discriminate against foreign suppliers.

[17]Borchert, Gootiiz, and Mattoo (2013) provide a detailed description of the World Bank's database.

as well as an aggregate of 20 countries in the European Union. In the econometric analysis below, we use the country-level STRIs for modes 3 and 1, but we reweight them to reflect the industry composition of U.S. foreign affiliate sales of services. Specifically, we reweight them according to the relative share of each industry in U.S. foreign affiliate sales for 2009-2012[18]

In a related study, Barattieri, Borchert, and Mattoo (2014) include the World Bank's mode 3 STRIs into an econometric model of the effect of STRIs on cross-border mergers and acquisitions activity, rather than foreign affiliate sales. Their analysis is based on transaction-level data on equity deals between 2003 and 2009. They estimate their model for all sectors combined, for manufacturing and services separately, and then for six specific services sectors. They find that the mode 3 restrictions have a negative impact on mergers and acquisitions activity that varies depending on the share of manufacturing in the economy of the host country.[19]

The OECD maintains its own services trade restrictiveness index.[20] We do not use the OECD index as an alternative measure of restrictions in our econometric analysis, because the OECD data have more limited country coverage. All of the variation in our econometric analysis comes from the country dimension, so it is important for us to maximize the size and diversity of our cross-section of countries.

Table 1 lists 46 countries that are reported individually in the BEA and World Bank datasets. These 46 countries together accounted for 85.6% of U.S. mode 3 sales of services to local economies in 2012. The list includes 8 countries that are involved in the Trans-Pacific Partnership negotiations with the United States, and 17 European Union countries that are involved in the Transatlantic Trade and Investment Partnership negotiations. The first column of numbers reports the dollar values of U.S. foreign affiliate sales to local markets in 2012. By this measure, the largest destination markets are the United Kingdom, Canada, Japan, Germany, and Australia – all larger than $50 billion in 2012. The ranking of the countries in this first column suggests that market size, level of economic development, and common language all contribute to the magnitude of U.S. foreign affiliate sales. The next column reports the reweighted values of the World Bank's STRI for mode 3.

[18] Many of the services trade restrictions are not sector-specific, and their contribution to the country-level STRIs is not affected by the reweighting.

[19] They also investigate the effect of individual policy measures: the policies that mattered most were restrictions on setting up branches, rules on the nationality of employees, and transparency in licensing.

[20] These data are in Table 3.1 in BEA's International Services database. at http://www.oecd.org/tad/services-trade/services-trade-restrictiveness-index.htm.

By this measure, the most restrictive countries are Peru, Thailand, Egypt, Mexico, and India. The least restrictive countries are Ecuador, South Africa, Nigeria, the Dominican Republic, and the Netherlands. The final column in Table 1 reports the reweighted values of the World Bank's STRI for mode 1. The most restrictive countries are the Philippines, China, Argentina, Thailand, Malaysia, and Saudi Arabia.

Our econometric analysis uses data from several additional sources. The measures of the GDP and GDP per capita of the destination country are from the IMF's World Economic Outlook database. The indicator for whether the destination country is English-speaking is from the CIA's World Fact Book.

There are disadvantages of using highly aggregated BEA data on mode 3 sales. The main limitation is that there are not many observations for identifying the effects of the services trade restrictions. A second issue is that there is a potential mismatch between the mode 3 sales and the restrictions, since they do not cover the same set of sectors.[21] On the other hand, by directly estimating the impact on aggregate mode 3 sales, we avoid extrapolating from firm-level responses based on assumptions about the representativeness of a sample.

The econometric model in equation (14) does not include a direct measure of the relative labor costs in the host country. It is difficult to reliably measure services sector wages for all 46 of the countries in our model. For 26 of the countries, the U.S. Bureau of Labor Statistics publishes an estimate of hourly compensation in the manufacturing sector in U.S. dollars. This measure is highly correlated with the dollar value of the country's GDP per capita. Therefore, we view the measures of GDP per capita that we include in the economic model as a reasonable control for relative labor costs in the host country. It is also likely a determinant of the expenditure share of services in the foreign market.

4. Econometric Analysis

In this section, we report the estimated parameter values for several versions of the econometric model, including the full model in equation (14) and two alternatives that serve as robustness checks. We estimated the parameter values using a Poisson pseudo-maximum likelihood estimator, following Santos Silva and Tenreyro (2006).

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[21] The BEA aggregate is broader than the set of services sectors covered in the STRD.

4.1. The Full Model

The full model includes all of the explanatory variables in equation (14). Table 2 reports the estimated coefficients of the full model. All of the explanatory variables have the expected signs: the mode 3 restrictions, international distance, and having an FTA with the United States all reduce mode 3 sales to the local market; mode 1 restrictions, the GDP and GDP per capita of the destination country, and the indicator that the destination country is English-speaking all increase mode 3 sales. All of the explanatory variables are statistically significant except for the FTA variable.[22] The estimated coefficient on STR_M3_j indicates that a ten point increase in STR_M3_j reduces model 3 sales to the local market by 24.7 percent. On the other hand, the estimated coefficient on STR_M1_j indicates that a ten point increase in STR_M1_j increases mode 3 sales to the local market by 16.8 percent.[23] These econometric estimates imply that there is significant inter-modal switching in response to the services trade restrictions.[24] The free trade agreements reduce mode 3 sales to the local market by 6.40 percent on average, though this coefficient is not precisely estimated.

4.2. Alternative Specifications

The first alternative specification in Table 2 omits the FTA variable, which was not individually significant in the full model. Omitting this variable in the alternative model has little effect on the estimated coefficient on mode 3 restrictions: the coefficient is slightly larger in absolute value, -0.0249 compared to -0.0247 in the full model. The Akaike Information Criterion (AIC) is higher for the first alternative model, and this indicates that it is a worse fit than the full model.

The second alternative specification includes the FTA variable but omits the year fixed effects to test whether the estimated impact of mode 3 restrictions is sensitive to the inclusion of these fixed effects. The estimated coefficients are still similar, -0.0258 compared to -0.0247 in the full model. A Wald test of the estimated coefficients on the year dummy variables indicates that they are jointly significant and should be included in the econometric model. The AIC is highest for the second alternative model, and this indicates that it is also a worse fit than the full model.

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[22] The coefficient on the FTA variable is not individually significant in the econometric models, but its inclusion improves the fit of the models.

[23] When we re-estimate the model using un-weighted country-level STRI values, the estimated coefficients are slightly smaller but similar: 22.6 percent and 14.1 percent, respectively.

[24] Van der Marel and Shepherd (2012) also find evidence of inter-modal switching in services supply. However, their analysis is based on an econometric model of cross-border exports (mode 1) rather than foreign affiliate sales (mode 3).

5. Counterfactual Calculations

Finally, we use the coefficient estimates from the full model in a set of counterfactual calculations of the effect of the mode-specific restrictions on U.S. mode 3 sales in the 46 countries.

5.1. Completely Eliminating the Services Trade Restrictions

In the first set of counterfactual calculations, we estimate how much larger U.S. mode 3 sales of services would have been in 2012 if the mode 3 restrictions had been zero in the particular country, if the mode 1 restrictions had been zero, or if the restrictions on both modes had been zero. These three different counterfactuals all involve completely removing the restrictions on one or both of the modes of supply. The World Bank's STRD is intended to measure restrictions that discriminate against foreign services providers, rather than non-discriminatory prudential standards for example. Discriminatory restrictions should all be subject to removal, and so our complete elimination of restrictions is a relevant counterfactual calculation, though extreme.

Table 3 reports the estimated effects as percentage changes. The effects of eliminating the mode 3 restrictions are positive for all countries (the first column of estimates). They range from 0.00 to 331.23 percent, with an average of 73.72 percent. The effects of eliminating mode 1 restrictions are negative for all countries (the second column of estimates). They range from -62.86 to -3.02 percent, with an average of -24.19 percent. The relative magnitudes within the first two columns depend on the current magnitude of the respective mode-specific restrictions as reported by the World Bank. The largest percentage increases from eliminating all mode 3 restrictions are in India, Egypt, the Philippines, and Thailand. The largest percentage reductions from eliminating all mode 1 restrictions are in Peru, Thailand, China, and Argentina. The final column combines the two effects, which are at least partly offsetting. The largest net effects are in Egypt, Indonesia, Saudi Arabia, India, Malaysia, and the Philippines, all with increases in mode 3 sales that are greater than 100 percent.

Table 4 reports the same set of counterfactual effects as changes in dollar values rather than percentage changes, based on the value of U.S. foreign affiliate sales of services to the countries in 2012. The increases in mode 3 sales from completely eliminating the mode 3 restrictions range from $0 to $92.8 billion, with an average of $10.8 billion. The reductions in mode 3 sales from completely eliminating the mode 1 restrictions range from -$20.6 billion to -$56.4 million, with an average of -$3.8 billion. The net increases in mode 3 sales from eliminating both types of restrictions range from -$11.2 billion to $67.2 billion, with an average of $4.1 billion.

5.2. Reducing the Services Trade Restrictions to Benchmark Values

Even if the restrictions are discriminatory, it may not be practical to eliminate them entirely. For this reason, we present a second, more moderate set of counterfactual calculations. Instead of completely eliminating all of the services trade restrictions, we reduce the restrictions to a mode-specific benchmark value, the 25th percentile value for the 46 countries in the estimation sample. For the reweighted mode 3 restrictions, the 25th percentile value is 7.1106. For the reweighted mode 1 restrictions, the 25th percentile value is 7.1974. If a country's measure of restrictions is already below the applicable benchmark value, then its measure of restrictions is not reduced in this second set of counterfactual calculations and there is no estimated effect on mode 3 sales in the country. In other words, the counterfactual caps the restrictions at the benchmark values.

The effects of capping the mode 3 restrictions are positive for 34 of the countries and zero for the other 12 (the first column of estimates). The effects range from 0.00 to 261.77 percent, with an average of 47.02 percent. The effects of capping the mode 1 restrictions at the benchmark values are negative for 34 of the countries and zero for the other 12 (the second column of estimates). They range from -58.08 to 0.00 percent, with an average of -15.30 percent. The final column combines the two partly offsetting effects. The net effects range from -48.38 to 164.27 percent, with an average of 21.12 percent.

5.3. Alternative Measure of Mode 3 Restrictions

As a further sensitivity analysis, we repeat the counterfactual calculations using an alternative measure of mode 3 restrictions that we constructed from the standardized measures in the STRD. These are the policy measures that are common to all of the services sectors.[25] Our alternative based on the standardized measures should be less sensitive to the mix of industries in the services aggregate, since it is limited to measures that affect all of the sectors. We re-estimated the econometric model with this alternative measure. The estimated coefficient on mode 3 restrictions is still negative and statistically significant.[26] We recalculated the first counterfactual in Table 3 with this alternative measure. Table 6 reports a side-by-side comparison of the percentage effects. On average the effects are smaller but similar when we use the alternative measure, a 62.96 percent increase in foreign affiliate sales compared to 73.72 percent. Australia, Chile, Egypt, and Thailand

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[25] Borchert et al. (2012) lists the standardized measures in the STRD.

[26] The magnitudes of the two coefficient estimates are not comparable, since the two explanatory variables include different sets of policy measures. On the other hand, the percentage effects in the counterfactuals are directly comparable.

have much smaller effects with the alternative measures, while India, Indonesia, and the Philippines have much larger effects.

6. Conclusions

The econometric analysis demonstrates that the services trade restrictions in the World Bank's database have an impact on the mode 3 sales of U.S.-parented multinationals that is economically and statistically significant. Restrictions on mode 3 sales directly reduce foreign affiliate sales of services, while restrictions on mode 1 sales increase foreign affiliate sales due to inter-modal switching.

Our main estimates indicate that completely eliminating restrictions on mode 3 supply would increase foreign affiliate sales by 73.72 percent on average across the countries, while completely eliminating restrictions on mode 1 cross-border exports of services would reduce foreign affiliate sales by 24.19 percent on average. These effects are smaller, but still economically significant, when we cap the services trade restrictions at the 25th percentile benchmark values rather than eliminating the restrictions entirely.

These estimates are subject to the data limitations that we have discussed in the paper, but we view them as a useful attempt to estimate the effects of the services trade restrictions on U.S. mode 3 sales of services. One direction for further research is to improve the data sources. A second direction is to try to refine the counterfactual calculations by limiting the reductions in services trade restrictions to policy changes that are likely to be actually achieved through current or future international negotiations.

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Table 1. Foreign Affiliate Sales and Services Trade Restrictiveness Measures

	Foreign Affiliate Sales of Services to the Local Market in 2012 (Millions of Dollars)	Reweighted Country STRI for Mode 3	Reweighted Country STRI for Mode 1
Argentina	8,056	5.10	46.55
Australia	51,249	28.70	10.22
Austria	3,891	7.11	9.30
Belgium	14,296	11.24	5.56
Brazil	35,895	23.85	29.52
Canada	124,282	22.58	7.47
Chile	11,454	23.94	10.48
China	36,460	30.43	48.38
Colombia	4,943	19.24	13.62
Costa Rica	973	22.49	38.50
Czech Republic	2,891	6.26	29.81
Denmark	4,708	9.95	4.25
Dominican Republic	1,526	4.05	3.93
Ecuador	991	0.00	19.54
Egypt	1,187	49.40	11.53
Finland	1,745	23.34	6.87
France	41,496	15.60	12.14
Germany	54,064	7.38	7.20
Greece	1,343	7.43	7.71
Honduras	333	9.96	35.35
Hungary	2,063	11.16	11.05
India	15,243	42.66	59.17
Indonesia	2,987	10.20	39.54
Ireland	27,077	7.20	4.71
Italy	24,060	8.82	17.76
Japan	75,678	12.64	12.16
Korea	11,556	14.45	8.45
Malaysia	7,217	21.68	44.44
Mexico	39,442	43.93	16.43
Netherlands	28,644	4.58	5.48
New Zealand	4,123	7.07	4.24
Nigeria	948	3.65	27.95
Panama	1,053	12.11	29.99
Peru	2,400	58.95	16.49
Philippines	3,529	28.87	48.45
Poland	6,146	5.24	5.36
Portugal	2,329	28.81	10.67
Russia	8,811	20.40	32.19
Saudi Arabia	2,651	15.76	42.12
South Africa	6,768	1.83	29.07
Spain	13,207	10.52	4.53
Sweden	7,762	10.11	7.10
Thailand	5,330	57.19	44.94
Turkey	4,210	14.91	8.79
United Kingdom	165,884	6.40	6.38
Venezuela	4,040	19.54	28.99

Table 2. Econometric Estimates

Dependent Variable:

Value of U.S. Foreign Affiliate Sales of Services to the Local Market, by Destination Country and Year

	Full Model	First Alternative	Second Alternative
Mode 3 Restrictions	-0.0247 (0.0078)	-0.0258 (0.0061)	-0.0249 (0.0078)
Mode 1 Restrictions	0.0168 (0.0075)	0.0158 (0.0078)	0.0165 (0.0074)
Log of GDP	0.8691 (0.0551)	0.8775 (0.0591)	0.8670 (0.0545)
Log of GDP per Capita	0.3645 (0.1051)	0.3424 (0.0750)	0.3567 (0.1049)
FTA with the United States	-0.0640 (0.2133)		-0.0631 (0.2129)
English Speaking	1.3238 (0.1366)	1.3114 (0.1336)	1.3245 (0.1369)
Log of Kilometers from the United States	-0.2696 (0.0508)	-0.2579 (0.0530)	-0.2711 (0.0509)
Year 2010	-0.0589 (0.0272)	-0.0592 (0.0274)	
Year 2011	-0.0850 (0.0325)	-0.0844 (0.0316)	
Year 2012	-0.0561 (0.0395)	-0.0558 (0.0389)	
Constant	2.4002 (0.9937)	2.4837 (0.8664)	2.4634 (0.9780)
Number of Observations	180	180	180
Pseudo R^2	0.9300	0.9298	0.9295
Akaike Information Criterion	404,249	405,291	406,936
χ^2 for the Year Effects	23.97	25.61	Not Applicable

The standard errors are reported in parentheses. They are corrected for clustering by country.

Table 3. Counterfactual Effects of Removing Restrictions on Services Supply

(Percentage Changes)

	Percentage Change in Mode 3 Sales from Setting Mode 3 Restrictions to Zero	Percentage Change in Mode 3 Sales from Setting Mode 1 Restrictions to Zero	Percentage Change in Mode 3 Sales from Setting Both Types of Restrictions to Zero
Argentina	13.42	-54.25	-48.11
Australia	103.18	-15.77	71.13
Austria	19.20	-14.46	1.96
Belgium	32.01	-8.91	20.24
Brazil	80.25	-39.09	9.78
Canada	74.65	-11.80	54.04
Chile	80.63	-16.15	51.46
China	112.02	-55.64	-5.94
Colombia	60.83	-20.45	27.94
Costa Rica	74.27	-47.62	-8.73
Czech Republic	16.74	-39.39	-29.25
Denmark	27.86	-6.89	19.06
Dominican Republic	10.52	-6.39	3.46
Ecuador	0.00	-27.98	-27.98
Egypt	238.78	-17.61	179.14
Finland	77.98	-10.89	58.59
France	47.01	-18.45	19.89
Germany	20.01	-11.39	6.34
Greece	20.15	-12.15	5.55
Honduras	27.90	-44.78	-29.37
Hungary	31.39	-17.10	8.92
India	331.23	-51.16	110.60
Indonesia	165.57	-15.75	123.74
Ireland	12.35	-11.39	-0.45
Italy	55.06	-13.78	33.70
Japan	35.04	-19.13	9.21
Korea	23.21	-21.55	-3.34
Malaysia	199.70	-30.52	108.22
Mexico	50.03	-52.20	-28.28
Netherlands	14.50	-7.40	6.02
New Zealand	11.03	-11.19	-1.40
Nigeria	99.43	-5.95	87.57
Panama	109.76	-18.41	71.15
Peru	50.27	-62.86	-44.18
Philippines	230.92	-38.43	103.74
Poland	14.16	-8.43	4.54
Portugal	30.14	-38.37	-19.79
Russia	121.45	-29.02	57.18
Saudi Arabia	183.06	-23.26	117.22
South Africa	105.02	-3.02	98.83
Spain	11.85	-16.19	-6.26
Sweden	19.18	-15.62	0.56
Thailand	203.47	-61.74	16.10
Turkey	24.23	-22.15	-3.29
United Kingdom	17.06	-10.20	5.13
Venezuela	104.62	-27.98	47.37

Table 4. Counterfactual Effects of Removing Restrictions on Services Supply
(Millions of Dollars)

	Change in Dollar Value of Mode 3 Sales from Setting Mode 3 Restrictions to Zero	Change in Dollar Value of Mode 3 Sales from Setting Mode 1 Restrictions to Zero	Change in Dollar Value of Mode 3 Sales from Setting Both Types of Restrictions to Zero
Argentina	1,081	-4,371	-3,876
Australia	52,879	-8,084	36,454
Austria	747	-563	76
Belgium	4,576	-1,274	2,894
Brazil	28,806	-14,033	3,511
Canada	92,776	-14,662	67,168
Chile	9,235	-1,850	5,894
China	40,842	-20,285	-2,166
Colombia	3,007	-1,011	1,381
Costa Rica	723	-463	-85
Czech Republic	484	-1,139	-846
Denmark	1,312	-324	897
Dominican Republic	161	-98	53
Ecuador	0	-277	-277
Egypt	2,834	-209	2,126
Finland	1,361	-190	1,022
France	19,508	-7,657	8,252
Germany	10,816	-6,157	3,426
Greece	271	-163	75
Honduras	93	-149	-98
Hungary	648	-353	184
India	50,490	-7,799	16,859
Indonesia	4,946	-471	3,696
Ireland	3,344	-3,084	-121
Italy	13,248	-3,314	8,109
Japan	26,520	-14,476	6,971
Korea	2,683	-2,490	-386
Malaysia	14,412	-2,203	7,811
Mexico	19,735	-20,587	-11,153
Netherlands	4,153	-2,120	1,726
New Zealand	455	-462	-58
Nigeria	943	-56	830
Panama	1,156	-194	749
Peru	1,206	-1,509	-1,060
Philippines	8,149	-1,356	3,661
Poland	870	-518	279
Portugal	702	-894	-461
Russia	10,701	-2,557	5,038
Saudi Arabia	4,853	-617	3,107
South Africa	7,108	-204	6,689
Spain	1,565	-2,139	-827
Sweden	1,489	-1,212	44
Thailand	10,845	-3,291	858
Turkey	1,020	-933	-138
United Kingdom	28,308	-16,917	8,504
Venezuela	4,227	-1,130	1,914

Table 5. Counterfactual: Reducing Restrictions to 25th Percentile Values

(Percentage Changes)

	Percentage Change in Mode 3 Sales from Capping Mode 3 Restrictions at Benchmark Values	Percentage Change in Mode 3 Sales from Capping Mode 1 Restrictions at Benchmark Values	Percentage Change in Mode 3 Sales from Capping Both Types of Restrictions at Benchmark Values
Argentina	0.00	-48.38	-48.38
Australia	70.45	-4.95	62.02
Austria	0.00	-3.47	-3.47
Belgium	10.74	0.00	10.74
Brazil	51.22	-31.27	3.94
Canada	46.52	-0.46	45.84
Chile	51.53	-5.37	43.39
China	77.87	-49.93	-10.95
Colombia	34.92	-10.23	21.12
Costa Rica	46.20	-40.89	-13.59
Czech Republic	0.00	-31.60	-31.60
Denmark	7.27	0.00	7.27
Dominican Republic	0.00	0.00	0.00
Ecuador	0.00	-18.72	-18.72
Egypt	184.22	-7.02	164.27
Finland	49.31	0.00	49.31
France	23.33	-7.97	13.50
Germany	0.68	0.00	0.68
Greece	0.80	-0.86	-0.07
Honduras	7.30	-37.68	-33.13
Hungary	10.23	-6.44	3.12
India	261.77	-44.89	99.39
Indonesia	122.80	-4.92	111.83
Ireland	0.00	0.00	0.00
Italy	30.09	-2.69	26.58
Japan	13.29	-8.73	3.40
Korea	3.37	-11.47	-8.49
Malaysia	151.42	-21.59	97.14
Mexico	25.87	-46.05	-32.10
Netherlands	0.00	0.00	0.00
New Zealand	0.00	0.00	0.00
Nigeria	67.31	0.00	67.31
Panama	75.98	-7.92	62.04
Peru	26.06	-58.08	-47.16
Philippines	177.62	-30.52	92.89
Poland	0.00	0.00	0.00
Portugal	9.18	-30.45	-24.06
Russia	85.78	-19.90	48.81
Saudi Arabia	137.46	-13.40	105.65
South Africa	72.00	0.00	72.00
Spain	0.00	-5.42	-5.42
Sweden	0.00	-4.78	-4.78
Thailand	154.59	-56.82	9.92
Turkey	4.22	-12.15	-8.44
United Kingdom	0.00	0.00	0.00
Venezuela	71.66	-18.72	39.52

Table 6: Counterfactual Effects with Alternative Measure of Mode 3 Barriers

Percentage Change in Mode 3 Sales from Setting Mode 3 Restrictions to Zero

	Using the Reweighted STRI Measures from Table 2	Using Measures Constructed from the World Bank's Standardized Measures
Argentina	13.42	11.42
Australia	103.18	12.26
Austria	19.20	19.16
Belgium	32.01	8.15
Brazil	80.25	50.17
Canada	74.65	70.47
Chile	80.63	5.36
China	112.02	153.14
Colombia	60.83	5.75
Costa Rica	74.27	17.84
Czech Republic	16.74	26.96
Denmark	27.86	13.10
Dominican Republic	10.52	17.84
Ecuador	0.00	11.84
Egypt	238.78	172.75
Finland	77.98	78.94
France	47.01	12.68
Germany	20.01	12.68
Greece	20.15	17.40
Honduras	27.90	42.53
Hungary	31.39	36.80
India	331.23	622.03
Indonesia	165.57	239.89
Ireland	12.35	4.19
Italy	55.06	12.68
Japan	35.04	32.77
Korea	23.21	25.55
Malaysia	199.70	118.05
Mexico	50.03	37.31
Netherlands	14.50	16.52
New Zealand	11.03	11.42
Nigeria	99.43	25.55
Panama	109.76	39.37
Peru	50.27	5.36
Philippines	230.92	379.03
Poland	14.16	0.00
Portugal	30.14	4.19
Russia	121.45	93.52
Saudi Arabia	183.06	41.47
South Africa	105.02	78.27
Spain	11.85	8.15
Sweden	19.18	15.23
Thailand	203.47	160.81
Turkey	24.23	52.99
United Kingdom	17.06	4.19
Venezuela	104.62	70.47