Trade in the Triad: how easy is the access to large markets?

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Abstract. In this paper, we measure market access between the United States, the EU, and Japan (the Triad), using the effect of national borders on trade patterns. We investigate overall and industry-level trends of bilateral trade openness and provide explanations for those using proxies for bilateral observed protection (tariffs and NTBs), home bias of consumers, product differentiation, and levels of FDI. The explanations related to actual protection, home bias and substitutability of goods put together explain a large part of the border effect between blocs of the Triad, although they do not explain the whole of the border effect puzzle. JEL classification: F12, F15

Commerce dans la Triade : jusqu'à quel point l'accès aux grands marchés est il facile? Cet article mesure le niveau d'intégration commerciale entre les pays de l'UE, le Japon et les Etats-Unis (la Triade) en utilisant l'effet des frontières nationales sur le commerce international. Nous étudions le niveau et l'évolution du degré d'ouverture bilatéral ainsi que les différentes explications possibles des effets frontière estimés qui sont testées à l'aide de variables capturant la protection (tarifs et BNTs), le biais domestique des consommateurs, le degré de différenciation des produits et les niveaux d'IDE bilatéraux. Les explications liées à la protection, au biais domestique et à la substituabilité entre produits, considérées ensemble, expliquent une bonne partie de l'effet frontière entre pays de la Triade, même si elles n'expliquent pas la totalité de l'énigme.

1. Introduction

The debate over the measurement of the 'true' level of the protection in Europe, in comparison with one of its main trading partners has recently

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been fuelled by diverging empirical evidence. According to Messerlin (2001), Europe has a high level of protection, which translates into a sizeable efficiency cost, estimated to represent one year of Spanish GDP. In contrast, recent work conducted by Bouët et al. (2004) presents a very different picture. Relying on applied tariffs and having properly calculated tariff equivalents of tariff quotas and specific tariffs, added anti-dumping duties, and taken into account the intricate EU preference schemes, they do not find Europe to be much more protectionist than the United States. The reason for this is quite simple: The EU has developed a myriad of preferential schemes with a vast number of partners in the world (mostly developing countries) and enforces MFN tariffs only towards a limited number of trade partners, among which Japan and the United States are the primary concerns.

However, this evidence associated with a direct measure of protection remains questionable. First, average tariff figures mask a reality plagued with numerous tariff peaks (Hoekman, Francis, and Olarreaga 2002). The associated dispersion in tariffs has led to the diagnosis of 'unfinished business' concerning market access reached by the WTO in a recent report (WTO 2002). Second, tariffs applied to different exporters by a given importer can vary widely: This is another dimension of the dispersion in tariffs. Being less protectionist on average can hide a highly distortive trade policy in which exports of 'non-preferred' efficient trade partners are deterred. Lastly, even limited tariffs can be protective if the price elasticity of imports is sufficiently large.

Considering this background of large and persistent difficulties in the *direct* measurement of protection, an *indirect* assessment of protection policies can be contemplated. As detailed in the recent survey on trade costs proposed by Anderson and van Wincooop (2004), international price differentials/distortions and deviations from expected trade patterns are two alternative research strategies to measure those trade costs.

Among the recent studies using the first strategy, Bradford (2003) relies on a detailed comparison of prices within the OECD (associated with Purchasing Power Parity calculations by the OECD) in order to derive price differentials between domestic and world markets. He concludes that protection levels revealed by this method are very large and disproportionately larger than those suggested by the simple measurement of tariffs.

The second strategy based on deviations from expected trade patterns uses different versions of the gravity equation as the benchmark of what trade volumes 'should be.' There is a large and old empirical literature on this topic, which has been focused, in particular, on assessing the impact of regional integration on trade flows (Frankel 1997 is an example of such a study with very large coverage of regional agreements). This type of work has been recently renewed in two related respects: first, through a narrowing of the gap between the empirical investigations and its theoretical foundations (see notably Feenstra 2003 for one of the most complete overview of the theoretical foundations of the gravity equation); second, through the emergence of the border effect literature. This methodology inverts the logic in the measurement of international commodity markets' integration. Let us take the example of two countries supposed to be highly integrated, the United States and Canada. How can one assess precisely the level of this integration? The border effect literature initiated by McCallum (1995), Helliwell (1996), and Wei (1996) does so by comparing their bilateral trade with the volume of trade taking place within their own borders, not with trade flows occurring between other pairs of countries chosen as a reference group, as was done traditionally in gravity equation approaches. The results have consistently shown strikingly low levels of international integration. Even the latest work by Anderson and van Wincoop (2003), focused on correcting an upward bias in the original McCallum estimate, shows that the U.S.A-Canada border makes 1993 trade between Canadian provinces 10 times larger than trade with U.S. states, everything else equal. This figure of impeding factor of national borders inside the European Union in the mid-1990s was still estimated to be between 6 (Chen, 2004) and 13 (Head and Mayer, 2000). Nitsch (2000) provides an intermediate estimate of 10, still a very high figure for a supposedly perfectly integrated market since 1993.

Our paper's first addition to the literature is the provision of estimates of reciprocity in market access for multiple bilateral combinations of trade partners that constitute a very significant part of world trade.[1] We assess in more detail the current level of integration of international markets and its evolution. We use trade flows between and within countries of the Triad (the United States, Japan, and each member state of the European Union) to evaluate the overall effect of national borders for those partners and, most important, whether we can observe some significant asymmetries in this (inverse) measure of integration. This question of symmetry in market access has been the subject of numerous concerns, especially among policymakers, with probably the most famous case being the recurrent claims by U.S. officials at the end of the 1980s of high protection restricting access of American exporters to the Japanese market for several industries. A newly available dataset of compatible bilateral trade and production enables a rigorous analysis of those and related claims over the period 1976–99 and for 26 industries.

A second point of this paper is to sort out the possible explanations of border effects estimated across country pairs and industries. Several causes of the border effects have been designated in the literature. The first obvious one relates to actual protection, should it be through tariffs or more subtle border-related trade hindrances. National borders can also coincide with delimitations of important differences in tastes among consumers, resulting in a *home bias*, which can give insights into the observed fall of trade volumes at the border.

1 A calculation using the United Nations' COMTRADE database shows that our sample (all trade flows are combinations between the EU12 countries, the United States, and Japan) represented 42% of world trade in manufactured goods in 2001.

Another possible explanation that has been little tested yet is the importance of foreign direct investment. European countries usually import very small volumes of American cars (even those cars that have the size and fuel consumption characteristics that actually make them suitable for European streets and fuel prices). Those 'missing imports' can result alternatively from actual protection by EU countries or from a home bias of EU consumers. However, it can also be argued that the important production of cars taking place within Europe in plants owned by American firms limits the actual 'need' for important trade flows. It is also likely that this last explanation is not independent from the two former ones: The theoretical and empirical literature on FDI/ export decisions suggests that American firms may have decided to produce on European soil because of a combination of high trade protection and the imperative adaptation of American cars to local tastes and needs.

Distinguishing between alternative explanations of border effects is an important public policy issue in that actual tariffs and other protective devices' cuts can be negotiated in the multilateral arena, whereas differences in tastes and bilateral FDI patterns are less subject to such negotiations.

Apart from the border effects literature, our paper is also strongly related to the set of articles providing rigorous measures of symmetry in bilateral openness, on the one hand, and to the papers measuring the impact of protection, most notably tariffs on trade patterns. Both sets of papers are growing, but are still rather small. Concerning symmetry, Harrigan (1996) estimates bilateral difficulties in market access and finds some asymmetry for the countries we analyse here: overall, the EU seems more closed to Japanese and U.S. imports than the reverse. Harrigan and Vanjani (2003) focus on Japanese trade flows and give insightful results about the long-term patterns for this country often considered as an outlier in international trade. Using a framework, a dataset, and a specification very comparable to ours, their results notably point out that the United States is structurally more closed to Japanese exports than the reverse (especially since the beginning of the 1990s). They do not, however, provide many empirical explanations for this finding. Head and Mayer (2002a) investigate a potential 'fortress Europe' effect during the European trade integration process. Using the border effects methodology, they measure the extent of additional difficulty in European markets access faced by Japanese and American producers. The authors find little evidence of a fortress Europe effect with respect to American exporters, but more suspicion seems warranted for imports of some specific Japanese goods. Here again, there is no second step that would explain the variance in border effects across country pairs and industries with protection-related variables.

Concerning papers that estimate the impact of observed measures of protection on trade patterns, Harrigan (1993) is an early example that finds that tariffs still matter: tariffs are found to have a large import-reducing effect (much larger than non-tariff barriers) for OECD countries in 1983. More recently, Lee and Swagel (1997) use a simultaneous equation approach to study the reciprocal interaction between trade flows and trade barriers. They find mixed results for the impact of both tariffs and NTBs on trade flows but use total industry-level imports rather than bilateral flows. Hummels (2001), Head and Ries (2001), Lai and Trefler (2002), and Romalis (2004) are examples of recent papers that use information on bilateral tariff rates at a detailed industry level to estimate price elasticities. The revealed effects of tariff protection on trade are large, with an implied elasticity of substitution in the underlying CES demand structure at 5.3 for Lai and Trefler (2002), 5.6 for Hummels (2001), 7.9 for Head and Ries (2001), and between 8 and 10 for Romalis (2004). Those results point to the empirical relevance of a simple solution to the border effect puzzle suggested by Obstfeld and Rogoff (2000): Even low levels of protection at the border can have large trade-dampening effects if price elasticities are sufficiently large. We investigate this claim further here by using tariffs and NTBs as potential explanations for the border effect in our sample of countries.

The rest of the paper is structured as follows: Theoretical underpinnings and related methodological issues are detailed in section 2. Section 3 gives results of our estimations, with section 3.1 presenting the results pooled over all industries. Detailed results at the industry level are examined in section 3.2. Finally, the respective impact of tariffs and other obstacles to trade are disentangled in section 4.

2. Measuring international market openness with border effects.

2.1. The model and estimable equation

Our empirical work consists of bilateral trade volumes estimations with a gravity-like specification derived (originally by Wei 1996 and followed by many others) from the now standard monopolistic competition trade model of Krugman (1980). It has been demonstrated recently by Anderson and van Wincoop (2003) that a proper derivation of the gravity equation from theory is crucially important for the validity of empirical results, especially in the case of border effects estimation. Monopolistic competition is not the only available model that can be used to derive the gravity equation (see Evenett and Keller 2003 for a global overview of conditions giving rise to the gravity equation), but it seems more natural in our case, which focuses on trade between some of the most industrialized countries in the world. This model combines CES utility with iceberg trade costs and non-strategic price-setting behaviour by firms. It is straightforward to show that this model yields the following compact characterization of trade patterns between country i and country j for a given industry (Head and Mayer 2000):

$$\frac{m_{ij}}{m_{ii}} = \left(\frac{a_{ij}}{a_{ii}}\right)^{\sigma-1}\left(\frac{p_j}{p_i}\right)^{-\sigma}\left(\frac{\tau_{ij}}{\tau_{ii}}\right)^{1-\sigma}\left(\frac{v_j}{v_i}\right), \tag{1}$$

where m_{ij} denotes imports of i from j and a_{ij} represent i's consumers' preferences with respect to varieties produced in j. During trade p_j, the mill price in country j, is shifted up by a transaction cost τ_{ij}, giving delivered price $p_{ij} = \tau_{ij} p_j$. Finally, v_i is the value of production of the considered industry in i. Functional forms for delivered prices (p_{ij}) and preferences (a_{ij}) have to be specified in order to obtain an estimable equation.

Trade costs are a function of distance (d_{ij}, which proxies for transport costs) and the level of protection of i, which can consist of an ad valorem tariff t_{ij} and the ad valorem equivalent of non-tariff barriers NTB_{ij} (intended to incorporate all protectionist measures that are not the direct ad valorem tariffs we observe in the empirics).

$$p_{ij} = \tau_{ij} p_j \equiv d_{ij}^{\delta}(1 + t_{ij})(1 + NTB_{ij})p_j.$$

The structure of protection varies across all partners' (EU countries, Japan, and the United States) pair and depend on the *direction* of the flow for a given pair. Let us specify this protection structure as follows: $(1 + t_{ij})(1 + \text{NTB}_{ij}) \equiv \exp\,[\eta \text{EU}_{ij} + \varphi \text{EU-USA}_{ij} + \psi \text{USA-EU}_{ij}]$. In this specification, EU_{ij} is a dummy variable set equal to 1 when $i(\neq j)$ and j belongs to EU. EU-USA_{ij} is a dummy variable set equal to 1 when $i(\neq j)$ belongs to the EU and j is the United States. USA-EU_{ij} is a dummy variable set equal to 1 when $j(\neq i)$ belongs to the EU, and i is the United States.[2]

Preferences have a random component e_{ij}, and a systematic (and importer specific) preference for goods produced in the home country, β_i. Sharing a common language is assumed to mitigate this *home bias*.

$$a_{ij} \equiv \exp\,[e_{ij} - (\beta_i - \lambda L_{ij})(\text{EU}_{ij} + \text{EU-USA}_{ij} + \text{USA-EU}_{ij})].$$

L_{ij} is set equal to one when two different countries share the same language. When L_{ij} switches from 0 to 1, home bias changes from β_i to $\beta_i - \lambda$.

We obtain an estimable equation from this monopolistic competition model of trade with home bias:

$$\begin{aligned}\ln\left(\frac{m_{ij}}{m_{ii}}\right) &= \ln\left(\frac{v_j}{v_i}\right) - (\sigma-1)\delta\ln\left(\frac{d_{ij}}{d_{ii}}\right) + (\sigma-1)\lambda L_{ij} - \sigma\ln\left(\frac{p_j}{p_i}\right)\\ &\quad - (\sigma-1)[\beta_i+\eta]\text{EU}_{ij} - (\sigma-1)[\beta_i+\varphi]\text{EU-USA}_{ij}\\ &\quad -(\sigma-1)[\beta_i+\psi]\text{USA-EU}_{ij} + \epsilon_{ij}, \qquad (2)\end{aligned}$$

with $\epsilon_{ij} = (\sigma - 1)(e_{ij} - e_{ii})$. Each of the dummy variables' (exponentiated) coefficients gives the border effect of the corresponding combination. For instance $\exp\,((\sigma - 1)[\beta_i + \eta])$ is the multiplying factor of *intra*-national trade with respect to international trade among the group of EU member countries. It includes *both* the average level of protection of the importing country (only

2 In order to stay compact in exposition, we present the model with only one combination (the EU-USA pair), the empirics will consider all combinations (EU-EU, EU-USA, EU-Japan, and USA-Japan pairs).

the NTB-related one η, because tariffs have been nil in this case since 1968) and the home bias of consumers (β_i). The coefficient on EU-USA$_{ij}$ indicates the difficulty for American exporters in their access to EU markets (also including both a preference and a protection component). Symmetrically, USA-EU$_{ij}$ indicates the difficulty faced by the average European exporter when selling its product to American consumers. The level of each of the two latter coefficients reveals the market access problems for each specified trade flow. Comparing the coefficients permits identification of possible asymmetries in market access. Whether this indirect evidence confirms the claims and grievances of officials or public opinion on market access reciprocity can be assessed at the global level or alternatively at the industry level.

As was notably emphasized by Harrigan (1996), there are concerns about potential endogeneity of right-end-side variables in equation (2), since demand, production, and prices are simultaneously determined in this model. Consider, for instance, a positive shock in the home bias of a given country. This will tend simultaneously to raise demand for the home product (relative to imports), but also relative domestic output and relative domestic prices. Indeed, an increase in home bias raises profitability of domestically based production (everything else held equal). In equilibrium, profits will be equalized through a combination of entry of new producers and/or higher local factor prices (which translate into higher marginal cost and hence higher prices). Empirically, this means that both v_j/v_i and p_j/p_i are likely to be responding to a change in border barriers, in addition to the trade response we want to estimate. Several solutions have been proposed in the literature. Harrigan (1996) instruments outputs with factor endowments, using a reduced-form equation valid under factor price equalization (an assumption that has the additional convenient feature of eluding the measurement and endogeneity issues associated with prices). However, while endowments in certain factors can safely be considered endogenous, physical capital is probably subject to the same simultaneity issue raised above. Another solution would be to use the theoretical prediction of unitary output elasticity and pass the output term on the left-hand side of the regression. Head and Mayer (2000) and Anderson and van Wincoop (2003), among others, adopt this strategy in some of their specifications. In both cases, border effects are not radically affected, which simply reflects the fact that in their papers the estimated income elasticity is quite close to one. We therefore find it preferable, as is usually done in the literature, to allow for this additional degree of freedom on the output term.[3] Concerning the price term, it is quite difficult to find an instrument with the

3 In unreported regressions, we followed this route of constraining the output coefficient to be one. We observe a rise in the distance coefficient and therefore a fall in estimated border effects, more pronounced for distant pairs of countries. The major noticeable change results in lower estimated border effects for Japan as an importer, reinforcing the results presented below. Note, however, that this constraint is here imposing a non-negligible distance with the originally estimated coefficient on output.

desirable features (see Erkel-Rousse and Mirza 2002, for a recent attempt). The price variable used here goes some way in the right direction, since we use a national price level variable rather than the industry/country-level price (or wage if labour is the only input) variable that would be dictated by theory. The aggregate price level is less likely to be correlated of industry-level changes in expected profits than industry-level factor rewards (we also experiment with different price variables in table 2, one of which – exchange rates – was used as an instrument by Erkel-Rousse and Mirza 2002). While our coefficients seem rather robust to the endogeneity issue, one has to keep in mind those endogeneity-related caveats when interpreting our results.

Most papers estimating border effects recognize the fact that the overall effect of national borders can be the result of a combination of home-biased preferences and/or trade policy, but very few actually try to empirically assess the part of the explanation that is more dominant. In particular, no paper (to date) incorporates the level of bilateral tariffs in the equation. It is clear from equation (2), that the part of 'missing trade' caused in reality by tariffs is attributed to the impact of crossing national borders (those where tariffs are implemented) and therefore is included in the coefficients on EU-USA$_{ij}$ and USA-EU$_{ij}$ in this equation.

We are interested here in giving a first assessment of the different explanations to the border effects. Our approach is to start with the 'usual' border effects equation estimation of equation (2) *without* including protection or other explanatory variables in section 3.1. Industry-level results will also be presented without including protection measures in section 3.2 in order to highlight the goods and partners' combinations for which market access is particularly difficult, independently of the causes of the difficulty. We then include in a second step the tariff variable within a broader set of explanatory variables incorporating proxies for NTBS and home-biased preferences in order to see how border effects coefficients are affected. This provides us with a measure of the weight of each class of determinant in usually estimated border effects. This is done in section 4.

2.2. *Data requirements*

We estimate equation (2) in order to capture border effects characterizing each of the possible bilateral combinations of trade partners: intra-EU trade, US to EU flows and reciprocal, Japan to EU flows and reciprocal, US to Japan flows and reciprocal. The needed data involve primarily bilateral trade and production figures in a compatible industry classification. These come from the Trade and Production 1976–99 database made available by Alessandro Nicita and Marcelo Olarreaga at the World Bank, which compiles this data for 67 developing and developed countries at the ISIC rev2 3-digit industry level over the period 1976–99. The original data come principally from United Nations statistical sources, the COMTRADE database for trade, and UNIDO industrial statistics for production. The World Bank files have a lot of missing values for production figures in recent years. We have largely extended the database on this aspect using more recent versions of the UNIDO CD-ROM together with OECD STAN data for OECD member countries, after using a conversion table from ISIC rev3 to ISIC rev2. We also completed the trade data, using the harmonized database of international trade from CEPII (BACI).[4] We end up with rather complete data in our sample consisting of eight EU members (the countries that were members throughout the whole period of the sample: Germany, France, Great Britain, Italy, Belgium-Luxembourg, The Netherlands, Ireland, and Denmark), the United States, and Japan for 26 industries. Relative prices are captured though a price level of GDP expressed relative to the United States. The data come from the Penn World Tables v.6.1.

This variable is admittedly far from the industry-level mill price required by the theoretical model. However, it offers three advantages: first, being less directly linked to industry-level production costs, the endogeneity concerns are slightly lower, as explained in the preceding section; second, the availability of this variable is larger; and last, its impact is estimated to be more consistent with expectations. We consider alternatives to this variable and compare results in table 2, in section 3.1, below.

The distance variable needed for the implementation of equation (2) is a slightly more complex than usual, as our specification requires measures of distances between and within countries. The conceptual and practical problems associated with this issue are discussed in Helliwell and Verdier (2001) and Head and Mayer (2002b). They primarily involve finding a consistent and relevant way to aggregate interregional distances within and between countries. We developed a new database of internal and external distances,[5] which uses city-level data in the calculation of the distance matrix to assess the geographic distribution of population inside each nation. The basic idea is to calculate distance between two countries based on bilateral distances between cities weighted by the share of the city in the overall country's population. The database also contains the contiguity and common language variables used here.

3. Results

3.1. Overall levels of market access and asymmetries

Table 1 gives results for different subperiods of regressions pooled over all industries. For ease of comparison between the different border effect coefficients, we drop the constant of those regressions and incorporate a dummy variable for each of the possible combinations of partner countries. The

4 http://www.cepii.fr/anglaisgraph/bdd/baci/baci.pdf
5 Available at http://www.cepii.fr/anglaisgraph/bdd/distances.htm

TABLE 1
Border effects between EU9 countries, Japan, and the United States

	Dependent variable Ln Imports Partner/Own					
Model	(78–80)	(81–84)	(85–88)	(89–92)	(93–96)	(97–00)
Ln rel. production	0.80[a]	0.80[a]	0.78[a]	0.80[a]	0.77[a]	0.73[a]
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Ln rel. prices	−0.84[a]	−1.44[a]	−0.33[c]	0.55	−0.33[c]	−1.34[a]
	(0.14)	(0.23)	(0.20)	(0.36)	(0.18)	(0.33)
Ln rel. distance	−0.59[a]	−0.52[a]	−0.47[a]	−0.59[a]	−0.60[a]	−0.64[a]
	(0.09)	(0.08)	(0.08)	(0.08)	(0.09)	(0.10)
Contiguity	0.53[a]	0.51[a]	0.50[a]	0.48[a]	0.43[a]	0.46[a]
	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.08)
Common language	0.67[a]	0.67[a]	0.57[a]	0.53[a]	0.65[a]	0.81[a]
	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)
EU9 → EU9	−3.16[a]	−3.05[a]	−3.07[a]	−2.71[a]	−2.72[a]	−2.55[a]
	(0.13)	(0.12)	(0.12)	(0.12)	(0.13)	(0.15)
EU9 → USA	−4.11[a]	−4.26[a]	−3.86[a]	−3.84[a]	−3.70[a]	−3.48[a]
	(0.18)	(0.15)	(0.15)	(0.15)	(0.18)	(0.20)
USA → EU9	−3.86[a]	−3.72[a]	−4.09[a]	−3.20[a]	−3.26[a]	−3.12[a]
	(0.31)	(0.30)	(0.29)	(0.31)	(0.32)	(0.36)
EU9 → Japan	−4.37[a]	−4.62[a]	−4.60[a]	−3.51[a]	−3.64[a]	−3.77[a]
	(0.35)	(0.32)	(0.34)	(0.35)	(0.37)	(0.43)
Japan → EU9	−4.31[a]	−4.34[a]	−4.63[a]	−4.18[a]	−4.17[a]	−3.66[a]
	(0.38)	(0.35)	(0.35)	(0.35)	(0.40)	(0.45)
USA → Japan	−3.46[a]	−3.21[a]	−3.45[a]	−2.31[a]	−2.57[a]	−2.82[a]
	(0.30)	(0.29)	(0.29)	(0.32)	(0.32)	(0.36)
Japan → USA	−3.46[a]	−3.70[a]	−3.45[a]	−3.78[a]	−3.55[a]	−3.17[a]
	(0.23)	(0.22)	(0.20)	(0.22)	(0.24)	(0.26)
N	5072	6584	6303	6213	6332	6317
R^2	0.930	0.919	0.924	0.919	0.911	0.894
RMSE	1.425	1.518	1.432	1.435	1.507	1.639

NOTES: Standard errors in parentheses: [a], [b], online and [c] represent, respectively, statistical significance at the 1%, 5%, and 10% levels. The reported standard errors take into account the correlation of the error terms for a given importer.

coefficient on those dummy variables enables the direct calculation of the border effect on the corresponding combination. When one dummy is dropped and the constant is kept, the overall fit of those regressions is around 0.6, in line and even a little higher than usual in pooled industry-level gravity equations.[6] The coefficient on relative production stays very stable, around 0.8, which is quite near the unitary value predicted by theory. The coefficient on distance is also very comparable with usual findings in gravity equations, with coefficients ranging from −0.47 to −0.64 and no apparent sign of decrease over time. When we take the estimate of the last period, it can be seen that speaking the same language more than doubles trade volumes and that having

6 As can be seen from the error term in equation (2), the errors have a correlated structure in our specification. We therefore use the Huber-White sandwich estimator with clusters defined at the importer-industry-year level to correct standard errors.

a common border raises trade volumes by 58%, everything else held constant. The coefficient on the price term is more disappointing, with a lot of volatility and too small implied values of σ. This result of low price elasticities when directly using proxies for prices is usual in the literature (see Erkel-Rousse and Mirza 2002, for instance).

The border effects for intra-EU trade reported in table 1 are regularly decreasing over time.[7] The European Integration revealed by this decrease in border effects is an ongoing and successful process.[8] Crossing a national border inside the EU reduces trade by a factor of exp (3.16) = 23.6 in the late 1970s, and by a factor of exp (2.55) = 12.8 in the late 1990s, which is a substantial increase in the level of integration and matches the orders of magnitude of preceding work (Head and Mayer 2000; Nitsch 2000; and Chen 2004, for instance). Note that, in the most recent period, two EU member countries speaking a common language have a border effect reduced to only 5.7.

The level of trade integration among EU countries seems unmatched in the other combinations considered here over the whole period. Only American exports to Japan are occasionally estimated to have an ease of access comparable with intra-EU trade. For instance, in the most recent period, the 12.8 figure for intra-EU flows compares with 32.5 for European exports to the United States and 22.6 for the reciprocal flow. Flows between the EU and Japan appear as the most impeded in our sample, while those between the United States and Japan show lower border effects. It has been shown that the border effect estimate is extremely sensitive to the measurement of distance among and within countries (Head and Mayer 2002b). The spectacular result that Japan would seem almost as open to U.S. exports as German consumers would be to French goods might be driven by a potential overestimate of the U.S.-Japan distance with respect to intra-EU distances. However, this issue touches equally the estimates over time and the coefficients on Japanese exports to the United States. The evolution and asymmetries in border effects among non intra-EU pairs are therefore not subject to this issue and can be considered informative in this respect.

The rather smooth and regular evolution for intra-EU trade flows contrasts with that observed for U.S. and Japanese access to the EU as appears in figures 1 and 2. Those figures are obtained through an estimation interacting the border effect for each inter-Triad combination with year dummies.[9] There

7 When referring to border effects, we always mean the multiplicative effect of national borders on trade with self compared with trade with an international partner. This corresponds to the exponential minus the coefficients (multiplied by -1) obtained on the dummy variables defined in section 2.1

8 Furthermore, owing to the Single Market entering into action in 1993, the statistical procedure for collection of trade flows changed (a threshold for declaration being introduced in international trade flows) and reduced observed trade flows, whereas the production value calculations were kept unchanged. This results in an overestimate of the border effect starting in 1993.

9 This procedure tends to smooth the evolution of border effects, compared with year-by-year estimates, which are more sensitive to outliers.

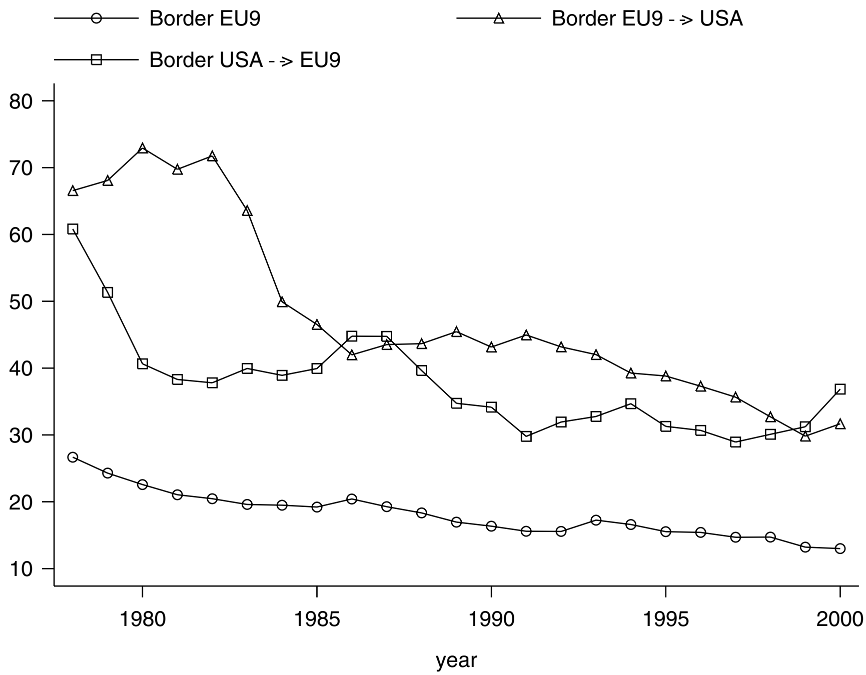

FIGURE 1 Border effects over time between the EU and the USA

is a noticeable increase in EU market access difficulties for American exporters in the middle of the 1980s; thereafter, U.S. producers benefit from a gradual decrease in obstacles. Japanese exporters have suffered from a constantly high level of border effect from 1978 to 2000, with a small improvement in EU market access in the mid-1980s reversed from the mid-1990s onward.

When we turn to the (reciprocal) European access to U.S. and Japanese markets, it appears from our results that, although the ease of access to the U.S. market for EU producers is substantially lower than the reverse, the gap is narrowing over time and recently has become very small. In relative terms, the asymmetry of EU market access evolution with third countries is even more apparent with Japan. During the 1985–90 period, the border effect stays constant for EU markets, but falls markedly for the EU exporters to the Japanese market. At the end of the period, the divergence is even clearer.

Figure 3 represents reciprocity in market access between the United States and Japan. The picture arising is clearly asymmetric with a much better revealed access of U.S. exporters to Japanese consumers than the reverse, everything else equal (holding constant, in particular, the respective size of

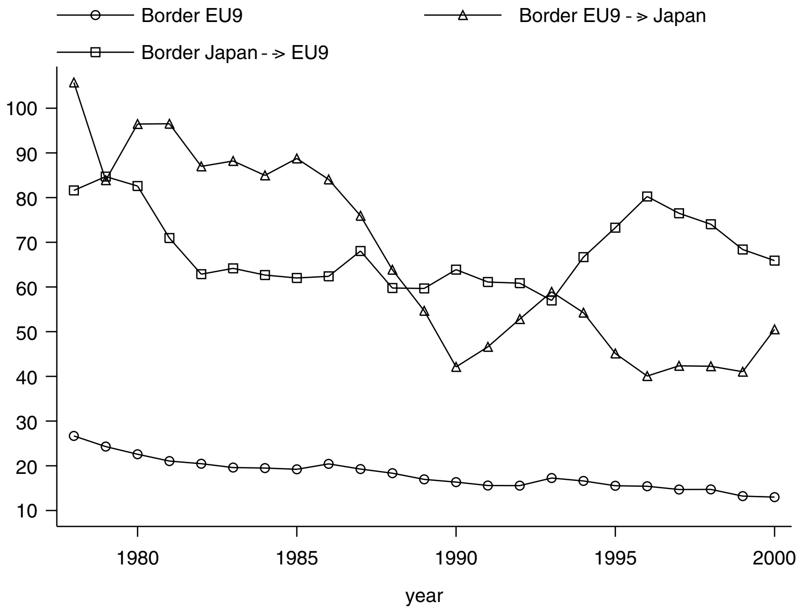

FIGURE 2 Border effects over time between the EU and Japan

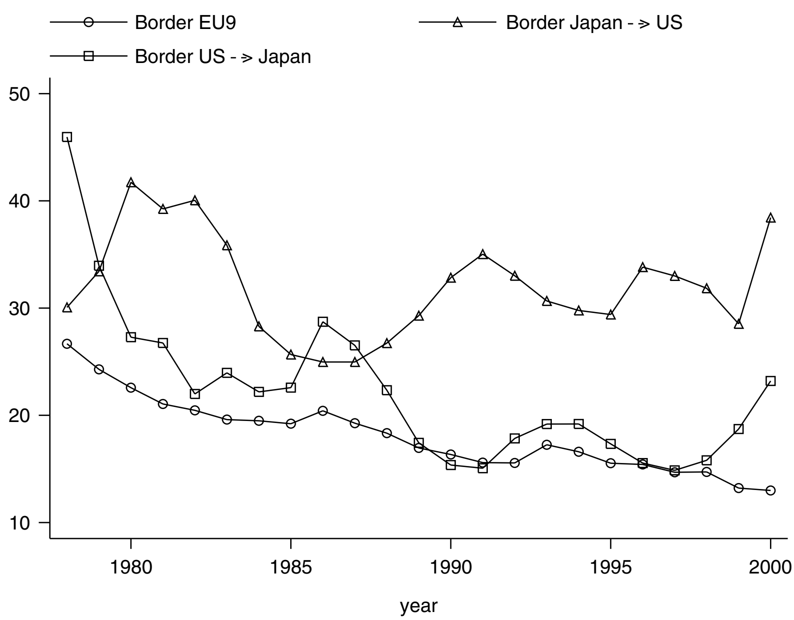

FIGURE 3 Border effects over time between the United States and Japan

the two economies through the relative production variable dictated by theory). This result, although surprising when confronted with the official positions and disputes concerning market access issues, is not isolated. Harrigan and Vanjani (2003) show in a similar framework that the American market is more closed to Japanese exports than the reverse and increasingly so since the beginning of the 1990s.

A striking feature of figures 1, 2, and 3 is the apparent negative correlation between respective bilateral border effects. Furthermore, those bilateral border effects seem influenced by nominal exchange rates movements. Indeed, for the European consumer, we should expect the increase of the U.S. dollar in the mid-1980s, for instance, to have generated substitution away from American goods and in favour of alternative sources, most notably domestic goods, thus creating a rise in the ratio of trade with self over imports from the United States and therefore a rise in the border effect if the exchange rate movement is not in the equation. The exchange rate movement *is, in fact, present* in our equation through the log of relative prices term (this variable exhibits, for instance, correlations with the log of nominal exchange rate of 0.93 and 0.96 for the Germany-United States/France-Japan pairs, respectively). Note, however, that the coefficient on the price variable is very small for some periods, denoting a low price elasticity of trade flows, which means that imports do not seem to react significantly to overall price changes largely caused by nominal exchange rate variation. This might be the result of incomplete pass-through of exchange rate variations by firms and therefore an overestimate of price volatility in our data not matched by high trade volume response. Obstfeld (2002) states that the standard empirical result is that pass-through rate is around 50% over a one-year horizon. Table 2 presents a sensitivity analysis using different price variables in regressions pooled over all industries and years, in order to search for a variable that would have a higher impact on trade patterns. Column (1) presents benchmark results with the same price variable as in table 1. Column (2) replaces this variable with the log of relative wages in the considered industry, assuming that labour is the only input of production and that the mark-up of prices over marginal cost is constant (as is the case in this model). Relative wages have no significant effect on trade flows. Column (3) directly uses the bilateral nominal exchange rate in the regression. Its impact is significantly negative, but the estimated elasticity is even lower than it is with the benchmark variable. Our last experiment is to separate the impact of the price variable depending on the fact that the observation involves two EU countries or not. The idea behind that distinction is that the response to price changes might be less important inside the EU and drive the overall coefficient towards 0. This hypothesis is supported by the results, which show a positive effect of relative price changes inside the EU, whereas the price elasticity (accounting for non

TABLE 2
Border effects in the Triad: different price variables, 1978–2000

	Dependent variable Ln Imports Partner/Own			
Model	(1)	(2)	(3)	(4)
Ln rel. production	0.77[a]	0.79[a]	0.82[a]	0.77[a]
	(0.01)	(0.01)	(0.01)	(0.01)
Ln rel. distance	−0.58[a]	−0.51[a]	−0.70[a]	−0.57[a]
	(0.04)	(0.04)	(0.04)	(0.04)
Contiguity	0.48[a]	0.55[a]	0.39[a]	0.49[a]
	(0.03)	(0.03)	(0.03)	(0.03)
Common language	0.67[a]	0.69[a]	0.60[a]	0.67[a]
	(0.03)	(0.03)	(0.03)	(0.03)
EU9 → EU9	−2.87[a]	−2.97[a]	−2.69[a]	−2.88[a]
	(0.05)	(0.06)	(0.06)	(0.05)
EU9 → US	−3.82[a]	−3.90[a]	−3.73[a]	−3.82[a]
	(0.07)	(0.07)	(0.07)	(0.07)
USA → EU9	−3.54[a]	−3.78[a]	−3.02[a]	−3.58[a]
	(0.13)	(0.13)	(0.14)	(0.13)
EU9 → Japan	−4.14[a]	−4.21[a]	−3.29[a]	−4.20[a]
	(0.15)	(0.15)	(0.16)	(0.15)
Japan → EU9	−4.08[a]	−4.50[a]	−4.01[a]	−4.09[a]
	(0.16)	(0.16)	(0.16)	(0.16)
US → Japan	−3.06[a]	−3.14[a]	−2.18[a]	−3.13[a]
	(0.13)	(0.13)	(0.14)	(0.13)
Japan → US	−3.38[a]	−3.63[a]	−3.72[a]	−3.35[a]
	(0.09)	(0.09)	(0.09)	(0.09)
Ln rel. prices	−0.85[a]			−1.05[a]
	(0.07)			(0.09)
Ln rel. wage		0.00		
		(0.04)		
Ln bilateral exchange rate			−0.07[a]	
			(0.00)	
Ln rel. prices intra-EU				0.43[a]
				(0.11)
N	37865	35340	37979	37865
R^2	0.915	0.916	0.916	0.915
RMSE	1.515	1.501	1.508	1.515

NOTES: Standard errors in parentheses: [a], [b], and [c] represent, respectively, statistical significance at the 1%, 5%, and 10% levels. The reported standard errors take into account the correlation of the error terms for a given importer.

intra-EU observations now) is raised. Nevertheless, the price response stays at low levels even in the latter case, probably reflecting an association between high prices and high quality of varieties. When looking at the evolution of asymmetries in global market access, one has therefore to keep in mind that nominal exchange rate fluctuations can be part of the causes, in addition to the other explanations we emphasize in section 4.

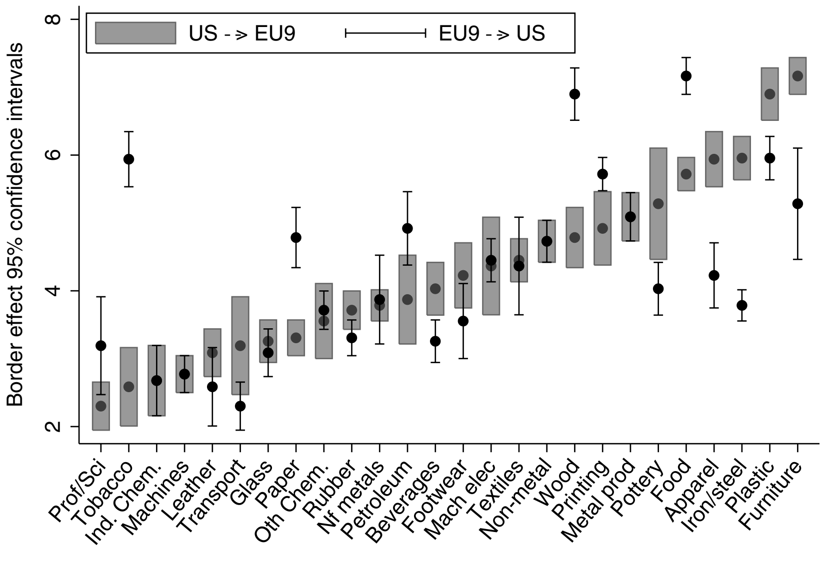

FIGURE 4 Industry-level market access between the EU and the United States: border coefficients

3.2. Results at the industry level

We now proceed to estimations at the industry level, in order to evaluate the degree of symmetry of revealed trade obstacles in bilateral relationships between the EU, the United States, and Japan for specific products. We begin with three figures (4, 5, and 6) representing bilateral symmetry in market access in the three different combinations pooled over the years 1978–2000. Each of those figures represents the point estimate together with the 5% confidence interval of the border effect in each direction of the pairwise combination. For instance, in figure 4, the horizontal axis has all industries covered in our sample. The grey box represents the 5% confidence interval of the border effect coefficient faced by American exporters on European markets (the grey dot represents the point estimate) for the considered industry. In black (line for the confidence interval and dot for the coefficient), are the corresponding border hindrances faced by European exporters on the American market. In this figure, the vertical respective positions of the black and grey dots for each industry indicate the degree of asymmetry in market access. Results are as follows.

First, there is a positive correlation between the reciprocal market access of different industries in each combination of trade partners, the most apparent correlation being between the EU and Japan. This can be interpreted in terms of endogenous protection (similar countries – like those here – protect their

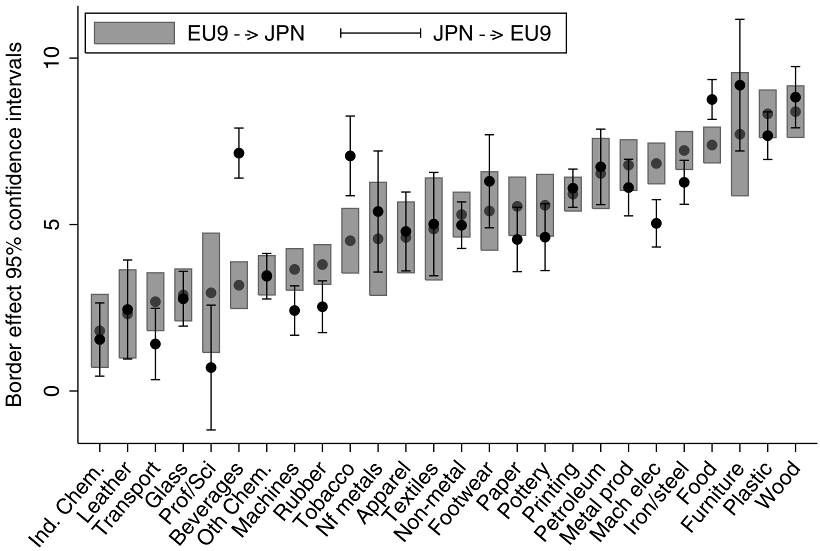

FIGURE 5 Industry-level market access between the EU and Japan: border coefficients

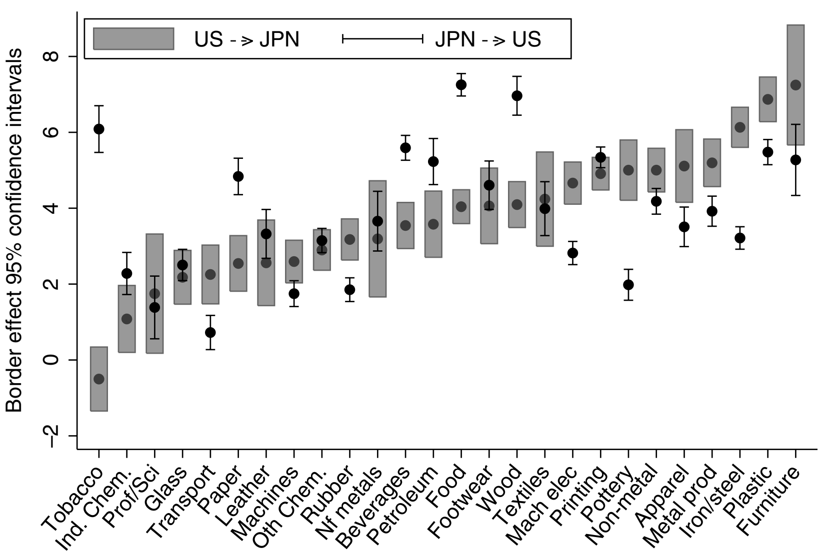

FIGURE 6 Industry-level market access between the United States and Japan: Border coefficients

'sensitive' industries in the same way, and industries tend to have the same pattern of sensitivity in all the considered countries). An additional explanation is in terms of industry characteristics (domestic preferences are more diversified in sectors such as food, leading to a larger border effect in all samples for this industry).

Turning to specific industries, we note that the Furniture, Plastic, Food, and Wood industries are systematic outliers, characterized by very large border effects in all combinations. Differences in tastes, transportation issues[10] and other factors related to distribution networks might explain this result. Conversely, Industrial chemicals, Professional and scientific equipment and Transport equipment, for instance, do face limited border effects in all bilateral relationships. Overall, those three figures do not support a 'strong asymmetry' view such that either the EU, the United States, or Japan would impose higher restrictions in market access to the two other partners over all goods: There seems to be a relatively comparable number of positive and negative differences in border effects in all three figures. Also, it appears that there are only two combinations where the border coefficient is not statistically different from zero: imports of Professional and scientific equipment by EU members from Japan and imports by Japan of American-produced Tobacco products. As this example shows, there are instances of very large asymmetries in market access. Japanese tobacco products' exporters face a very impressive border effect on the American market, while the reciprocal market access is estimated to be as free as the one of domestic producers. The food industry for the U.S.-Japan case and Beverages for EU-Japan are other examples of large asymmetries over the whole period. This suggests that asymmetries in preferences might be part of the explanation of revealed differences in reciprocal market access, together with asymmetries in actual protection levels, a topic we will turn to in section 4.

Figures 7, 8, and 9 give additional information on the evolution of market access difficulties over time. We graph the *difference in border effect coefficients* for each industry in each country pair for two periods (diamonds for 1980–89 and triangles for 1990–99).[11] Overall, in figure 7 we identify Furniture, Iron and steel, Pottery, Wearing apparel, Footwear, and Beverages, among others, to be industries more 'protected' in the EU (vis-à-vis U.S. producers) than in the United States (vis-à-vis European producers) during the first period. However, the asymmetry is shrinking over time for those industries. Reciprocally, Tobacco, Wood products, Food, Printing and publishing, and Paper and

10 Those results come from industry-level regressions, and therefore, industry-specific coefficients on distance should at least partly capture cross-industry differences in 'transportability' of the good.

11 Because we focus here on differences in market access estimates over time, a compact graphical representation of statistical significance is more difficult than in figures 4, 5, and 6. Note, however, that the vast majority of the underlying estimated coefficients have remarkably large levels of associated t-statistics. For each of the figures, the note identifies the few insignificant coefficients.

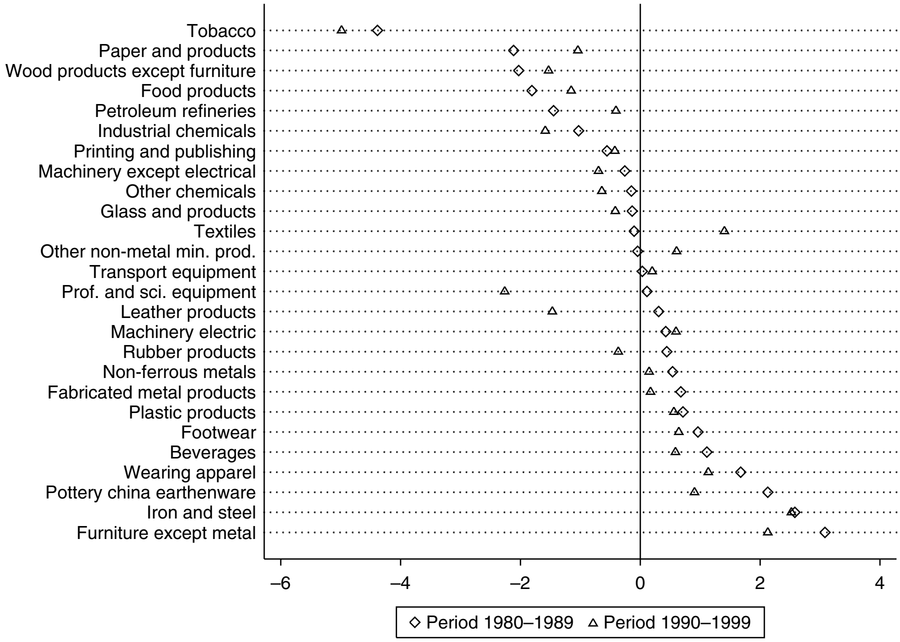

FIGURE 7 Asymmetries in border coefficients: (US → EU9)-(EU9 → US)
NOTE: All coefficients significant at the 5% level, except Tobacco (both periods), Leather (90–99, both directions), Ind. chem. (90–99) and Prof/sci (90–99), all for the US → EU9 direction

products markets were far more protected in the United States. Overall, the evolution of reciprocal integration is unclear, with American markets perhaps becoming slightly asymmetrically more open to European exporters over time, which confirms the finding of figure 1. As far as the bilateral relationship between EU and Japan is concerned, and considering the 1990–99 period, our results identify a large number of industries where access to EU markets by Japanese exporters is substantially more difficult than the reverse. This is in sharp contrast to the preceding period, where most industries lie to the left of the vertical line of 0 difference in coefficients. This global evolution also mirrors the one of figure 2. Beverages, Footwear, Tobacco, Wood products, Food, Printing, Leather goods, and Wearing apparel are among those sectors where the access to European markets for Japanese goods has asymmetrically deteriorated. Reciprocally, electrical and non-electrical machinery, professional and scientific equipment, rubber products, and transport equipment are more closed markets in Japan. A similar evolution seems to exist in the U.S.-Japan pair. In figure 9, most estimates seem to shift left, indicating a deterioration of the relative access of Japanese exporters on the American market. We obtain here industry-level detail from a trend already present in figure 3.

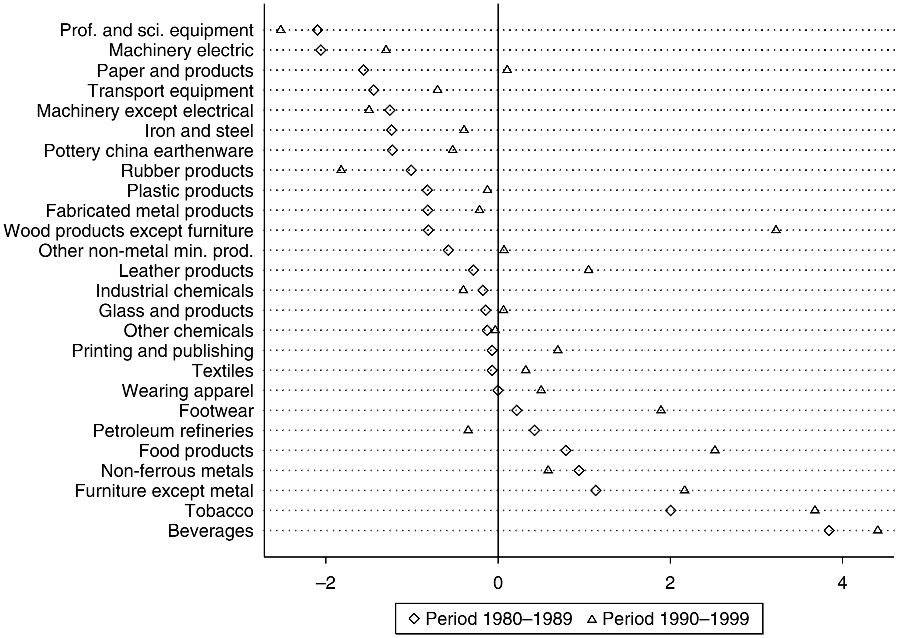

FIGURE 8 Asymmetries in border coefficients: (Japan → EU9)-(EU9 → Japan)
NOTE: All coefficients significant at the 5% level, except Leather (90–99, both directions), Ind. chem. (90–99, both directions), Transport and Prof/sci (90–99, Japan → EU9 direction)

The next step is to provide explanations for this variance in border effects, which reveal difficulties in reaching consumers in a certain country from another country. This is what we do in the next section.

4. Explaining border effects within the Triad

4.1. Possible explanations

This section aims at disentangling the different components of hindrances to market access. Returning to our modelling framework, we find that the coefficient (multiplied by -1, for ease of interpretation) estimated on the dummy variable JP-USA$_{ij}$, for instance, in the preceding section has a theoretical counterpart of[12]

$$(\sigma^s - 1)[\ln(1 + t^s_{ij}) + \ln(1 + \text{ntb}^s_{ij}) + \beta^s_i], \tag{3}$$

where $i =$ Japan and $j =$ United States. We now use the industry-subscript s that was omitted before for clarity, but now becomes crucial, as underlined in

12 In the estimations of section 3, no measure of tariffs or other protection measures have been explicitly included in the model.

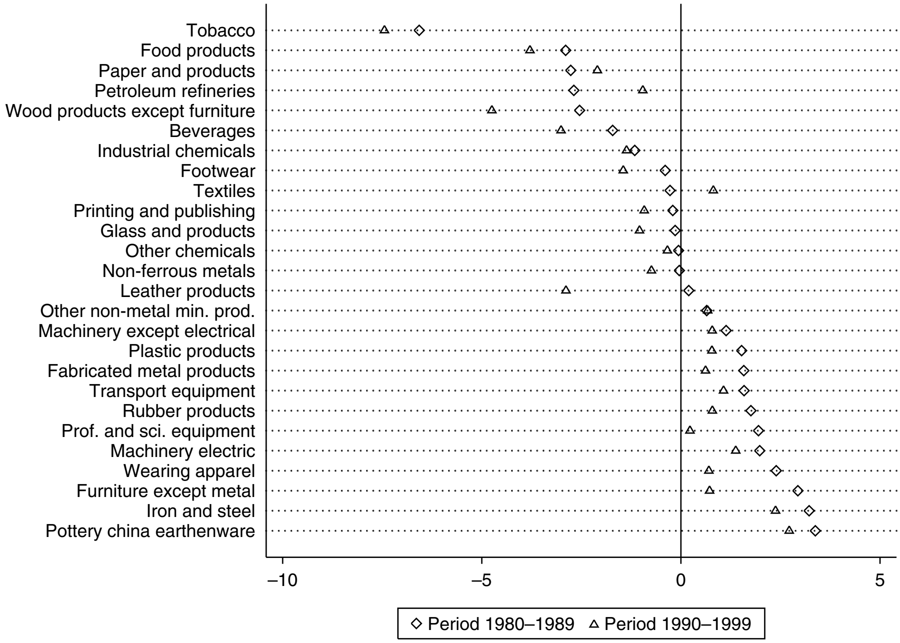

FIGURE 9 Asymmetries in border coefficients: (US → Japan)-(Japan → US)
NOTE: All coefficients significant at the 5% level, except Tobacco (80–89), Leather (90–99), Ind. chem. (90–99) and Prof/sci (90–99), all for the US → Japan direction

section 3.2: much of the variance in border effects will be related to variance of protection measures or home bias across industries. We want to introduce in the estimated equation proxies for the different terms in (3) and measure the resulting fall in the estimated border effect.[13] We therefore need industry-level variables for tariffs (t_{ij}^s), NTBs (ntb_{ij}^s) and home-biased preferences (β_i^s). Note, also, from (3) that the border effect is positively influenced by the elasticity of substitution of the industry (σ^s). The more homogeneous the product (high σ^s), the more sensitive to price differentials consumers will be, which yields a magnified trade volume response to the same level of trade costs (should it be protection or preference-based).

Tariffs can be measured at the bilateral level and for each product of the HS6 nomenclature in the TRAINS database from UNCTAD. We base our

13 An alternative procedure would use two steps, first estimating border effects coefficients and then regressing them on the possible explanatory variables. However, this involves the undesirable feature of using an econometric estimate as the dependent variable in the second stage. In addition, exploiting the full dimension of the problem would require estimating seven different border effects for each industry and year, which would result in certain regressions having very few observations and therefore an increased volatility in estimated border effects.

TABLE 3
Bilateral tariffs (in %) in 1999 between Triad countries

Industry	US → EU	EU → US	JP → EU	EU → JP	US → JP	JP → US
Apparel	11.8	12.6	11.8	13.2	13.2	12.6
Beverages	9.9	4.7	9.9	19	19	4.7
Food	10.2	4.7	10.2	14	14	4.7
Footwear	10.6	13.3	10.6	36	36	13.3
Furniture	1.6	2.9	1.6	4.8	4.8	2.9
Glass	5.2	5.9	5.2	2.1	2.1	5.9
Ind. chem.	4.9	4.4	4.9	3.9	3.9	4.4
Iron/steel	2.6	2.5	2.6	3.2	3.2	2.5
Leather	4.4	7.2	4.4	21.4	21.4	7.2
Mach elec	2.6	1.7	2.6	0.2	0.2	1.7
Machines	1.1	0.8	1.1	0.1	0.1	0.8
Metal prod	2.4	2	2.4	1.3	1.3	2
Misc	2.6	2	2.6	2.7	2.7	2
Nf metals	2.5	1.7	2.5	1.6	1.6	1.7
Non-metal	2.2	3.2	2.2	2	2	3.2
Oth chem.	2.1	1.6	2.1	2.1	2.1	1.6
Paper	2.9	0.7	2.9	1.9	1.9	0.7
Petroleum	2.5	5.2	2.5	3.3	3.3	5.2
Plastic	6.8	4.4	6.8	5	5	4.4
Pottery	6.8	6.2	6.8	2.3	2.3	6.2
Printing	1.5	0.4	1.5	0.2	0.2	0.4
Prof/sci	1.7	1.5	1.7	0.2	0.2	1.5
Rubber	3	2.4	3	0.5	0.5	2.4
Textiles	9.5	10.8	9.5	9.2	9.2	10.8
Tobacco	51.7	261	51.7	12.9	12.9	261
Transport	6.5	3.1	6.5	0	0	3.1
Wood	1.8	1	1.8	3.9	3.9	1

SOURCE: TRAINS converted to ISIC rev2 3-digit industries

investigation on this rather crude measurement of tariffs, namely, considering weighted averages of MFN tariffs among the three partners. This should be a reliable procedure for the countries under consideration, however, since they do not have any bilateral preference schemes. Those tariffs are aggregated from Jon Haveman's treatment of TRAINS data (UTBC Database[14]) in order to match our ISIC rev2 industry classification using the world imports as weights for HS6 products; an extract of the data for 1999 is shown in table 3. Even in manufactured goods, tariffs between industrialized countries are not negligible and vary quite substantially across industries and countries combinations.

Besides tariffs, there are other obstacles to trade imposed by governments at the border in order to protect national industries, which will be captured by the border effects in the above regressions. Those NTBs for which tariff equivalents are difficult to compute take a myriad of different forms, from traditional

14 http://www.eiit.org/Protection/extracts.html

border formalities and administrative harassment to more sophisticated sanitary and phytosanitary measures (Fontagné, von Kirchbach, and Mimouni 2001). We follow here Haveman, Nair-Reichert, and Thursby (2003) (using the same source data) and divide NTBs into four categories: (1) those that have direct price effects such as minimum import pricing, trigger prices, and variable levies, (2) those that involve quantity restrictions such as quotas, seasonal prohibitions, and orderly marketing arrangements, (3) those that involve quality restrictions such as health, safety, or technical standards, and (4) those that involve a threat of retaliation such as antidumping and countervailing duty investigations. For a given HS6 category, each NTB variable is set equal to 1 if at least one of the underlying tariff lines in that category is subject to an NTB and 0 otherwise. As for tariffs data, this information on NTBs is then aggregated to match the 3-digit ISIC rev2 classification by calculating a frequency index.

Within the EU, tariffs are 0 on all products since 1968. The removal of non-tariff barriers was the goal of the Single European Act, which targeted a vast number of observable remaining NTBs between EU members between 1987 and 1993. Our regressions will start in 1993, owing to protection data availability, that is, after completion of the single market inside the EU, where all government-controlled trade impediments should have been removed. The remaining border effect for intra-EU flows are therefore expected mainly to reflect causes other than protection. On the contrary, trade policy measures might still have a sizeable impact for all other combinations in our sample. Note that, even if actual protectionist measures are not the only explanation for the border effects differences we want to explain, some of the alternative explanations work in a quite similar fashion. An important potential explanation can be found in asymmetric preferences among consumers. For instance, EU consumers may have a particular taste for American tobacco products, while American consumers have, on the contrary, a particular distaste for EU goods in this industry. This type of preference pattern would therefore dampen, everything else equal, the level of trade from EU countries to the United States and raise the reciprocal flow. This consequence is *observationaly* equivalent to an asymmetric tariff on this good by the trading partners. Our approach here is to contribute to the literature by assessing which part of the variance of the border effects can be explained by simple differences in tariff rates and which part results from other determinants and preferences in particular.

Home bias of consumers is the other important candidate explanation. We capture the systematic preference for domestic goods (β_i^s in equation (3)) by using the intuitive distinction between final and intermediate goods in terms of the home bias. We suppose that preferences are more likely to be biased in favour of domestic products when consumers rather than firms decide the origin of the good consumed. There are opposing arguments. Wolf (1997) suggests that border effects can be particularly strong for intermediate goods because of geographic clusters of vertically linked industries.[15] However, results by industry from section 3.2 tend to indicate higher border effects for final consumption goods, and Head and Mayer (2000) find some relationship between the magnitude of market fragmentation and the fact that the goods of the industry are directed to final consumption. Using the United Nations Broad Economic Categories (BEC), defined in terms of SITC Rev. 3, Fontagné, Freudenberg, and Ünal-Kesenci (1996) classify the HS6 products into four categories according to their economic use: primary, intermediate, capital, and consumption products. We use their concordance table to calculate the share of final goods in the total external demand of a Triad importer in a given industry.[16] The sign of this variable is expected to be negative.

As outlined above, high degrees of product differentiation lower the incentive to substitute foreign varieties in favour of domestic ones for given trade costs. This will result in higher bilateral trade volumes and lower border effects. We proxy the degree of differentiation of traded goods ($1/\sigma^s$ in equation (3)) by the share of intra-industry trade in each industry-bilateral relationship. This share is calculated at the HS 6-digit level following the methodology introduced by Fontagné, Freudenberg, and Péridy (1998) that considers the flows between two countries to be interindustry when the flow in one direction amounts to less than 10% of the value of the flow in the other direction. Evans (2003) also uses a measure of the intra-industry trade share in total trade to proxy for differences in elasticities across industries, in addition to other proxies. She finds that all variables yield consistent results, which suggests that border effects fall with the degree of product differentiation. The variable used in the equation is the residual share of interindustry trade, which reflects homogeneity of products and has an expected negative sign in the regression.

Finally, concerning the FDI hypothesis, we use the bilateral stock of FDI between each combination of the Triad. The source is the OECD database, often used in gravity-like empirical work on FDI (Wei 2000 being a recent example), which gives those figures from 1980 to 2000. Although this variable lacks one dimension of our dataset (the industry level), it has the advantage of good overall reliability across the entire period. Hillberry (1999) employs the sectoral dimension but not the bilateral dimension, using the foreign-owned establishments' 1990 share of total U.S. employment in an industry.

15 Hummels (2001) shows that the tendency for firms to choose their locations so as to minimize the need to incur the costs associated with trade across geographic barriers such as distance or borders could explain the high coefficients on both variables in gravity models. Hillberry (1999) confirms this hypothesis showing that the estimated border effect depends negatively on the degree of geographic industry concentration. In Yi (2003), vertical specialization, which occurs when regions specialize only in particular stages of a good's production sequence, magnifies the effects of border barriers.

16 We are assuming that this share is not different from the share of consumption goods in the total demand, which includes the demand for domestic goods.

4.2. Results

Column (1) of table 4 gives coefficients for a regression without any variable intended to explain the border effect but with the sample constrained to be the one where all the explanatory variables, except FDI, are available. This enables a direct comparison of different coefficients when we introduce protection, product differentiation, and home bias variables accounting for the impact of borders on trade.

We start by introducing tariffs in column (2), in order to obtain a first estimate of the impact of tariffs alone on estimated border effects. The first result is that bilateral tariffs indeed impact trade significantly, even though our sample includes tariffs that can be considered relatively low (see table 3). Contrary to usual belief, tariffs still matter in shaping trade volumes, even between Triad countries, despite their limited average magnitude. The estimated price elasticity (σ in our theoretical framework) ranges between 1.96 and 3.79 here, depending on the specification. This estimate of σ is still lower than recent estimates from the literature, but we have only 26 industries, where Head and Ries (2001), for instance, estimate their σ to be around 8 with 106 industries.

Second, comparing columns 1 and 2, we observe a decrease in border effects for all combinations except intra-EU bilateral relationships[17] (which do not suffer from any tariff). Tariff barriers therefore contribute to the impact of national borders in the expected way: they tend to raise the ratio of internal to cross-border trade volumes. The border effects remain high, however, and significant, pointing to other important additional explanations.

The aggregated frequency index of all NTBs introduced in column (3) also impacts international trade negatively and significantly and yields a decrease in all relevant border effect coefficients. The most reduced border effects are those concerning the access to the Japanese market. This result is detailed in column (4), which considers the different types of NTBs separately and suggests a particular aggregation bias problem of NTB measures in this market (the most important fall in border effect becomes the one encountered by Japanese exporters in the U.S. market). The price NTBs seem to have the greater impact on trade flows, while the quantity NTBs show a positive although insignificant coefficient. Haveman, Nair-Reichert, and Thursby (2003) find that for the year 1993 the average level of tariffs reduced trade flows by 5.5% in their OECD countries sample. We find a close figure of $\exp(-2.66 \times \ln(1.0287)) - 1 = 7.3\%$. Their trade-reducing effect for NTBs is 8% on average; ours is 3.2%. This result of a measurable impact of NTBs contrasts with that of Chen (2004) and Head and Mayer (2000), who find that, inside the EU, residual NTBs at the end of the single-market program were not significant explanations of border effects.

The share of consumption goods in the total imports of each importer in each industry also reduces the estimated border effects, supporting our

17 The slight difference between the three first columns in the EU9 coefficient is due to rounding.

TABLE 4
Determinants of border effects in the Triad

	Dependent variable: Ln Imports Partner/Own						
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ln rel. production	0.73[a]	0.73[a]	0.72[a]	0.73[a]	0.72[a]	0.71[b]	0.69[a]
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Ln rel. prices	−0.72[a]	−0.73[a]	−0.75[a]	−0.75[a]	−0.77[a]	−0.71[c]	−0.59[a]
	(0.19)	(0.19)	(0.19)	(0.19)	(0.19)	(0.18)	(0.19)
Ln rel. distance	−0.66[a]	−0.65[a]	−0.65[a]	−0.65[a]	−0.63[a]	−0.54[a]	−0.36[a]
	(0.08)	(0.08)	(0.08)	(0.08)	(0.07)	(0.08)	(0.10)
Contiguity	0.44[a]	0.45[a]	0.45[a]	0.45[a]	0.47[a]	0.42[a]	0.42[a]
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)
Common language	0.79[a]	0.79[a]	0.79[a]	0.79[a]	0.82[a]	0.76[a]	0.24[a]
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.08)
EU9 → EU9	−2.60[a]	−2.61[a]	−2.61[a]	−2.61[a]	−2.30[a]	−2.18[a]	−3.85[a]
	(0.11)	(0.11)	(0.11)	(0.11)	(0.12)	(0.12)	(0.36)
EU9 → US	−3.61[a]	−3.45[a]	−3.37[a]	−3.34[a]	−3.14[a]	−3.03[a]	−4.76[a]
	(0.16)	(0.17)	(0.16)	(0.16)	(0.16)	(0.16)	(0.44)
USA → EU9	−3.03[a]	−2.85[a]	−2.76[a]	−2.74[a]	−2.61[a]	−2.63[a]	−4.75[a]
	(0.28)	(0.28)	(0.28)	(0.28)	(0.27)	(0.27)	(0.53)
EU9 → Japan	−3.64[a]	−3.48[a]	−3.25[a]	−3.38[a]	−3.14[a]	−3.14[a]	−4.81[a]
	(0.34)	(0.34)	(0.34)	(0.34)	(0.33)	(0.33)	(0.54)
Japan → EU9	−3.78[a]	−3.61[a]	−3.51[a]	−3.50[a]	−3.37[a]	−3.39[a]	−5.36[a]
	(0.35)	(0.35)	(0.35)	(0.35)	(0.34)	(0.33)	(0.58)
US → Japan	−2.55[a]	−2.39[a]	−2.18[a]	−2.30[a]	−2.04[a]	−2.04[a]	−4.15[a]
	(0.29)	(0.30)	(0.30)	(0.30)	(0.29)	(0.29)	(0.54)
Japan → US	−3.28[a]	−3.12[a]	−3.02[a]	−2.96[a]	−2.78[a]	−2.67[a]	−4.85[a]
	(0.23)	(0.23)	(0.22)	(0.23)	(0.22)	(0.22)	(0.52)
Ln (1 + tariff)		−2.66[a]	−2.37[a]	−2.79[a]	−1.30[a]	−0.96[b]	−1.21[a]
		(0.50)	(0.43)	(0.54)	(0.42)	(0.46)	(0.47)
Frequency index of NTB (all)			−0.85[a]		−0.62[a]	−0.44[c]	−0.55[a]
			(0.22)		(0.23)	(0.23)	(0.23)
Frequency index of threat NTB				−0.59[a]			
				(0.21)			
Frequency index of price NTB				−2.13[a]			
				(0.58)			
Frequency index of quantity NTB				0.85			
				(0.65)			
Frequency index of quality NTB				−0.51[c]			
				(0.27)			
Share of consumption goods					−0.86[a]	−0.87[a]	−0.74[a]
					(0.11)	(0.11)	(0.12)
Share of inter-Industry trade						−0.61[a]	−0.45[a]
						(0.13)	(0.13)
Ln bilateral FDI stock							0.14[a]
							(0.03)
N	7683	7683	7683	7683	7683	7683	6122
R^2	0.894	0.895	0.896	0.897	0.9	0.9	0.907
RMSE	1.552	1.543	1.538	1.535	1.513	1.506	1.451

NOTES: Standard errors in parentheses: [a], [b], and [c] represent, respectively, statistical significance at the 1%, 5% and 10% levels. The reported standard errors take into account the correlation of the error terms for a given importer.

hypothesis that the home bias is actually more important in the industries characterized by a large share of final demand. Unsurprisingly, this variable also reduces the explanatory power of tariffs and NTBs, which are generally more important in those industries. Our proxy for the degree of homogeneity of exchanged products, the share of inter-industry/one-way trade, also has the expected sign. The more homogeneous the goods exchanged, the more sensitive the consumers are to given levels of tariffs or other impediments to trade and therefore the lower the trade flows. The degree of homogeneity of the good exchanged is therefore also a significant part of the explanation of the border effect, as in Evans (2003). Note that all those explanations related to actual protection, home bias, and substitutability of goods together explain a large part of the border effect between blocs of the Triad in the years 1993 to 1999 studied here. The part explained ranges from 32.3% for the Japan → EU combination to 45.7% for the Japan → United States combination. Standard explanations of border effects are therefore empirically important, although they do not explain the whole of the border effect puzzle.

The stock of overall bilateral FDI has a positive impact on trade flows, which represents a confirmation that, at such an aggregate level, FDI and trade are complements rather than substitutes. This positive relationship supports the Hillberry (1999) hypothesis that international transactions costs could to be lower when the firm is multinational.[18] Aggregate bilateral FDI stocks are therefore *not* an explanation of border effects in our sample, although detailed data at the industry level would be needed to confirm this result.

5. Conclusion

We investigate in this paper the ease of reciprocal market access among the three constituent blocs of what is often referred to as the 'Triad' (the EU, Japan, and the United States). Our method involves an estimation of difficulties encountered by exporters located in one of the blocs when selling their products in another bloc. Those estimates come from a structural, gravity-like, bilateral trade equation, derived from the now canonical model of trade under monopolistic competition. It is based on a comparison of international trade flows with intra-national trade flows, the *border effect* method of assessing trade costs recently surveyed by Feenstra (2003) and Anderson and van Wincoop (2004). The level and asymmetry in border effects reveal the market access difficulties in each of the bloc combinations we consider.

Our results point to important differences and asymmetries in the quality of market access. A typical European country in the late 1990s has an average ratio of trade with self over trade with another EU country around 13 times

18 'To the extent that any of the border effect is due to fixed, rather than variable costs, multinational firms ought to have already incurred them and can benefit from returns to scale in international trade. Multinationals may also exploit cross-border trade as a means of reducing currency risk.'

larger than that predicted by the model, which gives an idea of the substantial level of fragmentation remaining in the EU. This fragmentation has largely decreased since the late 1970s, however, and its current level is generally much lower than in the rest of the sample. The same ratio for the United States, for instance, in relation to imports from the EU, is 32.5. Japan appears to be specially asymmetrically open to U.S. exports in the recent period, with a ratio of 16.8 against 23.8 for the reverse flows, which confirms recent results from Harrigan and Vanjani (2003). Results are also detailed across industries, and we identify industries where each bloc has specifically high revealed restrictions in its market access.

We show that a substantial part of those border effects can be explained by a set of determinants that have been proposed in the literature. We use several proxies to capture the fact that the level of border effects in a given industry can be caused by actual protection set by governments (tariffs and NTBs), home-biased preferences of consumers, and the degree of homogeneity of the good traded. The set of proxies used in our regressions to capture those determinants explains a substantial part of border effects. The explanatory power of those variables ranges from 32.3% of the Japan → EU border effect to 45.7% of the Japan → United States one. While the border effect puzzle is not *totally* solved, our theory-consistent method coupled with standard economic explanations manage to provide a good overall picture of the causes of market access difficulties in the Triad.

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