Regional trade agreement formation:
Do trade creation and trade diversion affect partner choice?

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Abstract

Some academic research suggests that governments will be more likely to form preferential trading blocs that are primarily trade diverting, while other research suggests that trade creating regional blocs are more likely. This paper presents a test of whether the trade creation and trade diversion that would be generated by a bilateral preferential trade agreement affects the probability that the agreement is signed. The estimates show that trade effects with positive welfare effects (trade creation and reverse trade diversion) make regional trade agreement formation more likely while trade diversion reduces the probability a regional trade agreement is negotiated.

1. Introduction

Viner (1950) pointed out more than a half century ago that regional trade agreements could be beneficial or harmful to the participating countries because the preferential nature of these trade deals generates both trade creation and trade diversion. Since the publication of his book, these two concepts have been central to most studies of regionalism and have led to an extensive theoretical literature. One question that remains unanswered empirically, however, is whether national governments consider the potential trade creating and trade diverting effects of regionalism in deciding which partner countries to negotiate a deal with.

Because regional agreements can be welfare-enhancing or welfare-reducing, the effects of regionalism depend critically on which country pairs choose to form preferential trade deals. As with many other issues in the regionalism debate, there are conflicting theoretical predictions about whether countries will be more likely to form regional trading blocs that raise or that lower welfare. Historically, most preferential trade agreements have been between countries that are close geographically and that already trade a lot with each other. Wonnacott and Lutz (1989) suggest that trade agreements between these types of "natural trading partners" are more likely to be trade creating, and thus they argue that the movement toward regional agreements is probably welfare-enhancing. A political economy approach to regionalism, however, suggests that countries could sign either primarily trade diverting or trade creating preferential agreements. Krishna (1998) argues that trade creation displaces a domestic industry and thus can generate political opposition to a regional agreement. Trade diversion, on the other hand, harms no domestic industry and thus does not lead to the same kind of political opposition. Thus, governments are more likely to sign trade diverting preferential agreements. Ornelas (2005), on the other hand, develops a model in which free trade agreements reduce the rents that domestic

interest groups and politicians receive from lobbying over tariffs. Politically motivated policy makers are more likely to adopt a free trade agreement if it raises national welfare enough to compensate for the lower lobby rents. In sum, theoretical arguments can be made on both sides of the debate over whether governments will tend to sign primarily trade-creating or trade-diverting regional trade agreements. The question is an empirical one.

This paper provides one of the first empirical assessments of whether the estimated trade creating and trade diverting effects of potential regional trade agreements affect the probability that they are signed.[1] It does so by using tariff data and trade elasticity estimates to calculate the trade creation and trade diversion that would be generated by bilateral free trade agreements between each possible pair of countries. The paper then estimates the impact of these trade creation and trade diversion measures on the probability that the pair of countries has a regional trade agreement in 2013. The empirical results show strong evidence that country pairs for whom a trade agreement would generate trade creation are much more likely to have a regional trade agreement than are country pairs for whom a trade deal would generate trade diversion.

2. Literature Review

Viner (1950, 43) discussed trade creation as being increased imports from within a trading bloc that the country "formerly did not import at all." Trade diversion, on the other hand, means the goods "which one of the members of the customs union will now newly import from the other whereas before the customs union it imported them from a third country." These concepts "have remained central to policy debates" on regional trade agreements (Panagariya,

[1] Note that this is a different question than asking whether free trade agreements lead to primarily trade creation or to trade diversion. The question here is how the trade creation and trade diversion that would be generated by a free trade agreement between a given pair of countries affects the probability that those countries sign a trade deal.

2000), and there have been a large number of studies that estimate whether free trade agreements lead to trade creation or to trade diversion (an example is Magee, 2008**)**.

There has been surprisingly little research, however, on whether potential trade creation and trade diversion affects the likelihood that a pair of countries signs a regional trade agreement. Baldwin and Rieder (2007) is one exception. They estimate a gravity model of trade creation and trade diversion for the European Union and EFTA and then investigate whether those estimates influence demand by countries to become European Union members. As the authors point out in the paper, their estimation "is clearly a first-pass approach" since EU membership is first taken as exogenous in estimating trade diversion coefficients and then is treated as endogenous in the second stage estimation. They conclude that countries trying to become EU members are both seeking trade creation and trying to avoid trade diversion, but the trade diversion effect is larger.

Baldwin and Jaimovich (2012) also shed light on whether trade diversion affects RTA formation. Country i is harmed if an RTA between countries j and k leads to trade diversion away from country i's exports. Baldwin and Jaimovich do not measure trade diversion directly but instead they create a contagion index that reflects how much a country's export profits are reduced if two of its trading partners form a regional trade agreement. They show that this contagion index significantly affects the probability that pairs of countries sign trade deals. Thus, countries tend to negotiate regional trade agreements at least in part in order to mitigate the trade diversion they are suffering because of previous RTAs between their trading partners. This paper differs from Baldwin and Jaimovich (2012) in what specific trade diversion is being investigated. Baldwin and Jaimovich examine how a trade deal between countries j and k affects the likelihood that countries i and j form an RTA. In this paper, I look at the prospective trade

diversion a deal between countries i and j will cause and then estimate what effect this trade diversion has on the probability that i and j form a regional trade agreement. To the best of my knowledge, no previous study has examined whether the trade creation and diversion that would be generated by a trade deal between two countries affects the probability that those two countries form a regional trade agreement.

Although it does not look specifically at trade creation and trade diversion, the paper in the literature that is the closest to this research is Martin, Mayer, and Thoenig (2012). They use a gravity model to estimate the trade gains country pairs will get from signing a regional trade agreement. The authors show that the probability a pair of countries will have a regional trade agreement in 2000 is higher the larger are the estimated trade gains from the agreement.

Many papers have investigated the factors that affect which pairs of countries choose to form RTA partnerships without studying whether trade creation and trade diversion affect this RTA formation. Grossman and Helpman (1995, p. 687), predict that a preferential trade agreement "is most likely when there is relative balance in the potential trade between the partner countries." The intuition is that a country with a large bilateral trade deficit will have many lobby groups opposing a preferential trade agreement and few groups supporting it, and thus the agreement is likely to fail. With relatively balanced bilateral trade, however, it is possible for each country to muster the political support necessary for the PTA to be approved.

A pair of democratic governments may be more likely to sign a trade deal than other potential country pairs are for several reasons. First, Mitra, Thomakos and Ulubasoglu (2002) provide evidence that democratic governments place greater weight on social welfare than do dictatorships. If trade agreements are welfare-enhancing, then democracies are more likely than dictatorships to pursue them. Second, it is likely that legislators in a republic are more likely to

approve a preferential agreement if the proposed partner is also democratic. In the debate over NAFTA, for instance, a common argument made by members of the House of Representatives against the agreement was that it would reward Mexico for undemocratic political practices, as Baldwin and Magee (2000) show. Liu and Ornelas (2014) describe a different link between democracy and free trade agreements. They show that free trade agreements can increase the likelihood that a democratic government survives by reducing the rents that a potential autocrat could earn through lobbying over trade policy. Thus, unstable democracies have a greater incentive to enter into free trade agreements than do either stable democracies or autocracies.

One of the most common theoretical arguments about which country pairs will find preferential trade agreements to be economically beneficial is the natural trading partner hypothesis, which argues that regional trade deals between nearby countries with significant bilateral trade are more likely to be trade creating than trade diverting. The logic is that the scope of trade diversion is limited to the products that a country would normally import from outside its preferential trading area. If most trade is regional even in the absence of a preferential agreement and most preferential trade deals are regional, then there will not be much trade from outside the RTA to be reduced by the trade deal. This hypothesis has been most strongly advocated by Wonnacott and Lutz (1989) and Krugman (1995). Baier and Bergstrand (2004) find that characteristics about country pairs that (in theory) should increase net trade creation and welfare from a trade deal are positively related to the likelihood that the pair forms a free trade agreement. They show that countries are more likely to form a free trade agreement the closer they are geographically, the more remote they are from the rest of the world, the more similar they are in economic size, and the more different they are in capital-labor ratios. While their paper shows that characteristics such as distance (which is thought to be related to trade creation)

affect free trade agreement formation, they do not do what this paper attempts: calculate the actual trade creation and trade diversion that would emerge if a pair of countries formed a free trade agreement and then estimate whether those values of trade creation and trade diversion are related to the probability the pair of countries sign a trade deal.

Krishna (2003) provides a test of the natural trading partner hypothesis. He estimates the welfare effects of preferential tariff reductions between the United States and 24 partner countries. He finds that the welfare effects of bilateral tariff reductions are not correlated with either distance from the United States or with bilateral trade flows. Thus, he concludes that agreements with nearby (or major) trading partners are not preferable on welfare grounds to trade deals between more distant (or smaller) trading partners.

A number of other papers have also discussed what types of regional agreements are most likely to be welfare-enhancing. Krueger (1999, p. 116) surveys the literature and concludes: "There may be some presumption that a PTA between a developed and a developing country is more likely to improve welfare … than an agreement between two developing or two developed countries." In standard Ricardian or Heckscher-Ohlin trade models, there are no gains from trade between countries with identical technologies and capital-labor ratios. The gains from trade based on comparative advantage are larger among dissimilar countries, and therefore North-South trade agreements should generate greater economic benefits (*ceteris paribus*) than North-North or South-South trade deals. North-South trade deals may be difficult to negotiate, however. Levy (1997) develops a model showing that a free trade agreement is politically feasible only if both countries are on the same side of the world median capital-labor ratio.

Viner (1950) speculated that customs unions encompassing larger economic areas and with countries that have a low degree of complementarity and a high degree of rivalry with

respect to protected industries should exhibit more trade creation than trade diversion. Rosson, Runge, and Moulton (2000) argue that trade creation is more likely in a preferential trade deal when there are more countries involved and a larger economic area, when the countries involved are competitive rather than complementary economies, and when the nations are in close proximity.

3. Data and Empirical Model

The key data requirement for this study is to be able to measure the trade creation and trade diversion that would be the result of a bilateral free trade agreement between any two pairs of countries (even those pairs that have not signed a free trade agreement). This paper uses the partial equilibrium model developed in Magee (2017)[2] to measure bilateral trade creation and trade diversion. Figure 1 shows the export supply and import demand curves.[3] Countries i and j are considering signing a bilateral free trade agreement. The curve MD_i shows the import demand curve for country i. The export supply into country i is the sum of the export supply from the rest of the world (XS_{row}, all countries except j) and the export supply from country j (XS_j). Prior to a bilateral free trade agreement between i and j, consumers in country i pay a price P for imports. The price received by exporters in country j is $P(1-\tau)$, and τ is the most-favored nation ad valorem tariff country i charges on imports. The total imports of the good into

[2] This model is an extension of Schiff and Winters (2003, p. 57).

[3] Figure 1 shows foreign export supply curves to be upward sloping. For a small importing country in a fully integrated world market, the export supply elasticity faced by the importer would be infinite so that XS_{row} would be horizontal at the world price. In such a case, a small regional trade agreement would have no impact on the price of the imported good and the agreement would not generate any trade creation (Schiff and Winters, 2003, p. 57). This paper assumes that the world market is segmented because of transportation costs or other trading costs that differ between country pairs. Thus, some countries would continue to supply exports to country i even if its price fell. This assumption is consistent with evidence from Broda, Limao, and Weinstein (2008). They examined 15 countries, including a number of small ones such as Algeria, Latvia, Lebanon, and Taiwan, and found that they all had market power in trade. In 14 out of 15 countries, the estimated foreign export supply elasticity in the median industry was below one.

country i are M_i, with M_{row} coming from the rest of the world and $M_i - M_{row}$ coming from country j.

A free trade agreement that eliminates the tariff on imports into i from j causes the export supply curve from j to shift downward by the amount of the tariff to XS_j'. The price of imports into i falls to P', and total imports of the good rise to M_i'. Imports into i from j rise from $M_i - M_{row}$ to $M_i' - M_{row}'$. The increase in imports of $M_i' - M_i$ is trade creation because it is an increase in imports that is not offset by a fall in imports from any other country outside the free trade area. The decline in imports from countries outside the free trade area is $M_{row} - M_{row}'$. This change is trade diversion if the earlier exporter does not have a free trade agreement with i, or a reversal of previous trade diversion if the earlier exporter already has an RTA with country i.

Assuming the export supply and import demand curves are linear, if country i eliminates its initial MFN tariffs on imports from j, the change in its import price would be[4]:

$$\%\Delta P = -\frac{e_{xs,j} * \tau}{e_{xs} - e_{md}} \frac{M_{ij}}{M_i}. \quad (1)$$

The elasticity of import demand for the good in country i is $e_{md,}$ the elasticity of export supply from country j is $e_{xs,j}$, the total elasticity of export supply from all countries selling into country i is e_{xs},[5] and the imports into i from j is M_{ij}. The import demand elasticity is negative and the export supply elasticities are positive, so the import price either declines or remains constant when the free trade agreement eliminates tariffs on trade between the two countries. Country i's total imports of the good rise by:

[4] Note that these calculations are based on the hypothetical elimination of MFN tariffs under a free trade agreement or customs union. They are intended to provide an estimate of the long-run impact (after the phase-in period) of eliminating MFN tariffs. The empirical estimation does not consider partial scope agreements to be free trade agreements.

[5] This elasticity will be a weighted average of the export supply elasticity in each of the exporting countries, where the weight is the exporting country's share of country i's imports of the good.

$$\Delta M_i = \frac{-e_{md} * e_{xs,j} * M_{ij} * \tau}{e_{xs} - e_{md}}. \quad (2)$$

Equation (2) shows the trade creation from the agreement.[6] The price of the good imported into country i is falling, so imports of the good into i from each country other than j will fall by:

$$\Delta M_{ih} = \frac{-M_{ih} * e_{xs,h} * M_{ij} * e_{xs,j} * \tau}{M_i * (e_{xs} - e_{md})}, \quad (3)$$

where M_{ih} is the pre-RTA level of country h's exports to i, and $e_{xs,h}$ is country h's elasticity of export supply. The change in imports shown in equation (3) is either zero or negative. It reflects trade diversion away from country h if countries h and i do not have a pre-existing free trade agreement. It reflects a reversal of previous trade diversion if countries h and i do have a pre-existing free trade agreement. If equation (3) is summed over all countries with whom i does not have a pre-existing trade agreement, we get the total trade diversion caused by a free trade agreement between countries i and j. If equation (3) is summed over all countries with whom i has a pre-existing trade agreement, we get the total reversal of previous trade diversion caused by a free trade agreement between countries i and j.[7]

The trade effects in equations (2) and (3) are not the full effect of a free trade agreement because they do not capture other impacts of trade deals such as synchronizing regulations, eliminating nontariff barriers to trade, and imposing rules of origin. The goal of the model is not to measure the full effect of a potential free trade agreement between two countries, but rather to get estimates of trade creation and trade diversion for many different possible agreements and

[6] Any trade effects of a preferential agreement that divert trade from other sources would leave the country's total imports unchanged. Thus, the change in the country's overall imports due to an agreement would be trade creation.

[7] Note that the calculations are made at the industry level. For each of 13,572 pairs of an importer and potential RTA partner, the trade effects of eliminating bilateral tariffs on the importer's trade with all the remaining 115 countries in the data set had to be estimated in each of over 5000 industries. Those effects were then summed across industries and across countries to get the estimated total trade diversion or reverse trade diversion the potential RTA would cause.

then to see whether governments consider these impacts in making their decisions about which partners to choose for regional trade agreements. The concepts of trade creation and trade diversion are based on changes in the tariff rates applied to imports, and they are not dependent on changes in regulations, rules of origin, etc. Using industry-level import-demand and export-supply elasticities, equations (2) and (3) can provide estimates of the trade creation and trade diversion that would be caused if a pair of countries reduced tariffs on bilateral trade from the most-favored nation level to zero. This approach is similar to Karemera and Ojah (1998), who use estimated industry-level import demand elasticities to calculate the impact of the NAFTA's elimination of tariffs. Note that it is possible to use equations (2) and (3) to get estimates of trade creation and trade diversion both for pairs of countries that already have free trade agreements and for pairs of countries that do not have a free trade agreement. In both cases, the equations just project what the estimated effect on trade flows would be if the tariffs on bilateral trade were lowered from the MFN level to zero.

Estimates of import demand elasticities for each six-digit Harmonized System industry and for each country are provided by Kee, Nicita, and Olarreaga (2008). The median value of the import demand elasticity in the data set is -0.99, which falls between the median import demand elasticity of -1.13 for many countries in Tokarick (2010) and the median elasticity of -0.4 for the G7 countries in Hooper, Johnson, and Marques (2000). Export supply elasticity estimates come from Tokarick (2010). The median export supply elasticity estimate is 0.82, which is close to the median estimate of 0.62 in Broda, Limao, and Weinstein (2008). In cases where an elasticity estimate was unavailable in a particular country and industry, I use the average estimated elasticity from the industry across all countries.

Tariff data for 2012 and 2013 for all countries at the 6-digit HS industry level come from the World Trade Organization. Data on which pairs of countries have free trade agreements or customs unions in 2013 are based on the list of regional trade agreements in force that have been notified to the World Trade Organization. The list of country pairs with trade deals was compared to a data set from José de Sousa (2012) available at http://jdesousa.univ.free.fr/data.htm. A country pair is considered to have a regional trade agreement if they have a free trade agreement or customs union that has been notified to the WTO and is in force in 2013. Country pairs with partial scope agreements are not counted as having a regional trade agreement.

The trade creation, reverse trade diversion, and trade diversion estimates from equations (2) and (3) are three important possible factors affecting the probability that a pair of countries will form a regional trade agreement. There are a number of other factors that also affect whether two countries share a trade deal. Magee (2003) and Baier and Bergstrand (2004) are two early examples of papers that estimate models of RTA formation. Baier and Bergstrand (2004) develop and estimate a model in which RTA pairings depend on how close the two countries are to each other, how remote the two countries are from the rest of the world, the difference in the countries' economic sizes, and the difference in their capital labor ratios. Magee (2003) also includes an adjacency dummy variable, a dummy variable for countries that share the same language, a trade deficit/surplus variable, and a dummy variable indicating that both countries are democracies.

This paper uses many of these same variables as control variables in its model of RTA formation. Countries that are near each other tend to have more economic and political ties. They are "natural trading partners" in the language of Wonnacott and Lutz (1989) and are more

likely to gain from a preferential trade deal. The use of the term regionalism to describe the spread of preferential agreements indicates this tendency of countries to form agreements with partners in their own region of the world. To capture the impact of proximity on RTA formation, I use the variable Natural from Baier and Bergstrand (2004). It is the natural log of the reciprocal of the distance between the pair of countries. I also include the Baier and Bergstrand measure of remoteness from the rest of the world. This variable is defined as the average of the log distances of each country from all the other countries in the world for any pair of countries that are on the same continent. It equals zero for any pair of countries that are not on the same continent. I include a dummy variable for countries that share a land border and a variable for countries that share a common language as well.

When countries have a large bilateral trade deficit with each other, it can create political tensions between them and make the deficit country hesitant to remove its bilateral trade barriers. The Trump administration's criticisms of bilateral US trade deficits with China, South Korea, Mexico, and Germany are evidence of this tendency. Thus, the model in this paper includes a variable measuring the absolute value of the bilateral trade deficit as a share of bilateral trade. The expectation is that countries are less likely to have a regional trade agreement if their bilateral trade is imbalanced.

Baier and Bergstrand (2004) argue that countries are more likely to have a regional trade agreement if they are of a similar size. The model estimated in this paper includes a variable measuring the absolute difference in the two countries' log GDP levels. The difference in the GDP per capita of the countries may also influence RTA formation. This effect could arise because of either political or economic considerations. Politically, countries that are at a similar level of economic development may find it easier to negotiate a trade deal. When there is a large

difference in income per capita, the workers of the richer country may fear competition from low-wage workers in the poorer country. Thus, politically, we would expect regional trade agreements primarily between nations with similar incomes per person. Economically, however, there may be greater gains from trade based on comparative advantage if the two countries have very different capital-labor ratios. Since per-capita incomes are highly correlated with capital-labor ratios, considerations of the economic gains from a trade deal might suggest that agreements are more likely between countries with dissimilar per-capita incomes. Egger and Larch (2008) use absolute difference in GDP per capita to proxy for differences in factor endowments.

Unobserved characteristics of individual countries may make them more likely to sign trade deals with a large number of other countries around the world. These tendencies can be controlled for in the regressions by using fixed effects for each country. A more parsimonious way of controlling for the tendency to sign trade deals with any other partner country is to include a variable measuring the total number of RTA partners that the pair of countries have with all other nations around the world (excluding any agreement the countries might have with each other). The empirical analysis uses both of these methods.

Finally, countries will get greater economic gains from a trade deal if the two countries tend to trade a lot with each other. Thus, we would expect significant bilateral trade to increase the probability that a pair of countries will sign a regional trade agreement. The difficulty in testing this hypothesis is that regional trade agreements affect bilateral trade, so the trade variable is endogenous. Thus, the next section excludes the bilateral trade variable from some of the regressions. In other specifications, the estimation uses instrumental variable probit analysis to identify the causal impact of trade on RTA formation.

Table 1 presents the definitions, sources, and means for all of the variables used in the empirical analysis. To be included in the data set, a country needed to be a member of the WTO (so there is information about its regional trade agreements), and it needed to have trade data from the UN, GDP data from the World Bank, and political classification data from the Polity IV data set. Despite these restrictions, the data set includes 117 countries, which results in 6,786 country pairs.[8] About 26% of the country pairs in the data set had a regional trade agreement in 2013. This percentage is higher than in some previous studies using panel data that extend back several decades when there were far fewer preferential agreements in place.

One thing to note from Table 1 is that the estimated impacts of eliminating bilateral tariffs are very small. For the average pair of countries, eliminating bilateral tariffs leads to $112 million in trade creation, $448 million in trade diversion, and $604 million in a reversal of trade diversion caused by earlier trade deals. As a share of the countries' GDPs, these impacts of bilateral free trade are negligible. The trade creation impact is only 0.006% of GDP on average, while trade diversion is 0.019% of GDP and reverse trade diversion is 0.036% of GDP. Removing bilateral tariffs leads to trade creation of 0.019% of the two countries' total imports, to reverse trade diversion of 0.11% of total imports, and to new trade diversion of 0.07% of total imports.

4. Results

This section presents tests of two main early claims from scholars who argued that regionalism would be largely welfare-enhancing. The first claim tested is that regional trade

[8] Each observation is a country pair, where Mexico-US and US-Mexico are counted as a single observation (the dyads are not directed). The trade creation variable for the observation is the sum of Mexico's trade creation if it eliminates its tariffs on imports from the United States and the trade creation in the US if the US eliminates its tariffs on imports from Mexico.

agreements between countries that tended to trade a lot would lead mainly to trade creation rather than trade diversion. The second claim investigated is whether these types of trade agreements are more likely to be signed than are trade deals that would lead mainly to trade diversion.

Table 2 presents a test of the first claim by regressing measures of net trade creation on distance, contiguity, the size of the two economies, and the number of other RTAs that the two countries already have in force. Net trade creation here is defined as trade creation plus reverse trade diversion minus new trade diversion. The first two terms have unambiguously positive welfare effects (absent any market failures) while new trade diversion causes a reduction in world welfare. Net trade creation is not a direct measure of welfare, so Table 2 is not judging whether regional trade agreements raise or lower welfare. Rather, it is a first attempt to assess the claim that certain types of trade deals are more likely to be trade creating than others. Model 1 measures net trade creation in billions of dollars. Model 2 measures net trade creation relative to the two countries' total imports. Model 3 measures net trade creation relative to the two countries' GDP levels.

The coefficient estimates support the predictions of the natural trading partner hypothesis. Net trade creation is significantly higher when a preferential trade agreement is signed if the two countries are nearer geographically and if they share a land border. A regional trade agreement between countries that share a land border is associated with about $4 billion more in net trade creation than an otherwise equivalent agreement between countries that do not share a border. A 10% increase in the distance between the two countries reduces net trade creation by about $0.5 billion dollars. Rosson, Runge, and Moulton (2000) suggested that agreements are more likely to be trade creating if the countries involved are economically larger. This prediction is also

supported in the estimates in Table 2. The coefficient on the log GDP variable is positive and statistically significant at the 1% level, though the effect is not large in magnitude. A 10% rise in the total GDP of the two countries is associated with an increase of about $5 million in net trade creation. This result is consistent with Lee, Park, and Shin (2008). They found that the trade creation impacts of regional agreements were larger if the pair of countries could be considered natural trading partners (they were closer geographically, shared a border, and shared a common language).

The total number of regional trade agreements the two countries have (other than with each other) is included in the regression as a control variable. More previous regional agreements mean that any new deal signed would tend to reverse previous trade diversion rather than generating new trade diversion. The estimates in Table 2 show that on average, each previous RTA already in existence would lead to an increase of about $16 million in net trade creation when a new RTA is formed.

If bilateral trade as a share of GDP is added into the regressions, only one of the results in the table changes. Controlling for bilateral trade flows means that larger economic size of the two countries is no longer significantly correlated with net trade creation (in any of the three models). Interestingly, however, net trade creation remains significantly higher, even after controlling for the level of bilateral trade, among countries pairs that are closer geographically, that share a land border, and that already have a number of other regional trade agreements in place.

The dependent variable in Table 2 has measurement error for several reasons. The net trade creation variable is estimated based on an assumption of linear demand curves, which is unlikely to be exactly true for every industry. It also uses estimates of export supply and import

demand elasticities, and those estimates are imperfect measures of the exact values of the elasticities. The measurement error in the dependent variable raises the variance in the error term of the regression but it does not create a bias in the coefficient estimates. In Table 3, the estimates of trade creation, trade diversion, and reverse trade diversion are used as explanatory variables to predict the likelihood that a pair of countries has formed a preferential agreement. In that case, the classical measurement error will create an attenuation bias so that the coefficient estimates tend to be biased towards zero.

Table 3 presents results of a probit regression of RTA formation on measures of trade creation, trade diversion, and reverse trade diversion along with other country pair characteristics. The dependent variable equals one if the two countries have a regional trade agreement in 2013. The table shows the marginal effect of a one unit change in the explanatory variable on the probability that the pair of countries have a regional trade agreement.

The trade effects of each possible regional trade agreement in equations (2) and (3) are measured in billions of dollars, but the impact on RTA formation depends on how large these effects are relative to trade flows or to the size of the countries involved. Thus, this paper uses two different ways to scale the trade effects of the regional agreements. In models 1 and 2, trade creation, reverse trade diversion, and trade diversion are measured as a percent of the total imports into the two countries.[9] In models 3, 4, and 5 these RTA trade effects are measured as a percent of the total GDP in the two countries. Models 2, 4, and 5 include bilateral trade flows as a share of GDP in the regression while Models 1 and 3 exclude bilateral trade as an explanatory variable because of the endogeneity concerns associated with the variable.

[9] Similar results emerge if the trade effects of regionalism are measured relative to the size of bilateral trade. Scaling by bilateral trade, however, means that pairs of countries with no bilateral trade must be excluded from the regression.

The estimates show that the expected trade effects of regional agreements have a statistically significant impact on how likely a pair of countries is to have a regional trade deal. As one would expect if countries choose RTA partners that will produce positive trade effects, greater trade creation and greater reverse trade diversion increase the likelihood that a country pair will have a regional trade agreement while higher levels of trade diversion reduce the probability of a trade deal having been signed. Each of those results is statistically significant at the 1% or 5% significance level in all five models in Table 1. The trade creation effect is the largest of the three in all the models estimated. The positive impact of a one percentage point increase in expected trade creation as a share of GDP or of imports is typically about three times larger than the negative effect of trade diversion. In all the models, the difference between the coefficient on trade creation and the (negative of the) coefficient on trade diversion is statistically significant at the 1% level. The difference between the coefficient estimate on the trade creation variable and the coefficient on reverse trade diversion is statistically significant at the 5% level. Similar results emerge whether the expected RTA trade effects are measured relative to the countries' trade flows or relative to GDP levels.

The coefficient estimates of the control variables in the model are statistically significant in most cases and are plausible in their signs. When one of the two countries has a large bilateral trade deficit with the other one, it reduces the probability that the two countries have a regional trade agreement in force. A one standard deviation increase in the bilateral trade deficit reduces the probability of a regional trade agreement by 2.5 percentage points. Country pairs are more likely to conclude trade deals with each other when they are at a similar level of economic development. In four of the five models, a larger difference in GDP per capita levels between the countries significantly reduced the likelihood that they would have a regional trade

agreement. If the difference in the two countries' GDP per capita levels rises by one standard deviation, the probability of their having a regional trade agreement falls by 1.7 to 1.9 percentage points in Models 1 to 4. It is possible that there is some concern with endogeneity of the GDP per capita difference variable if regional trade deals help the poorer country more than the richer country. That would mean that the regional trade agreement reduced the difference in GDP per capita, which could explain the negative correlation between the two variables. Bilateral trade deals are generally estimated to have only small effects on countries' income levels, however, so this potential endogeneity is not a significant concern in this case.

The models in Michaely (1998) and Baier and Bergstrand (2004) predicted that countries are more likely to sign free trade agreements if they are of a similar economic size. The coefficient on the difference in GDP variable is negative in all five models, which is consistent with this prediction. The coefficient is not statistically significant in any of the regressions, however, so the empirical support for this prediction is weak.

Some countries are more open than others about signing preferential agreements with lots of other partners. To control for this tendency, the first four models of Table 3 include a variable counting the number of bilateral trade agreements the two countries have with the rest of the world (not including each other). The positive coefficient on this variable is not surprising. It captures unobserved characteristics of countries that make them more (or less) likely to sign trade deals with any other partners. Model 5 uses a dummy variable for each country (equal to one if country i is one of the two countries in the dyad) in order to control for the tendency of individual countries to sign regional trade deals with other countries. Controlling for unobserved country tendencies to form regional trade agreements in this way does not change the main results in the analysis. The coefficients on the trade creation, reverse trade diversion, and trade

diversion variables remain statistically significant at the 1% or 5% levels. The only meaningful changes in the results in Model 5 are that the estimated impacts of the difference in GDP per capita and of having a common language are smaller than in the other models and are no longer statistically significant.

Countries that share a land border and that have the same official language are more likely to have a regional trade agreement. Sharing a land border raises the probability of a pair of country having an RTA by between 21 and 25 percentage points. Sharing a language raises the probability of an RTA by 5 to 6 percentage points in the first four models. The fraction of country pairs with a regional agreement in the data set is 26%, so these effects are relatively large. As expected, the positive coefficient on the Natural variable indicates that the farther that countries are away from each other geographically, the less likely it is that they share a regional trade agreement. A 10% increase in geographic distance reduces the probability of a regional trade agreement by about 0.9 percentage points in Models 1 to 4 and by about 1.9 percentage points in Model 5. Interestingly, as Baier and Bergstrand (2004) show, country pairs that are remote from the rest of the world are significantly more likely to sign regional trade agreements. Combined with the results in Table 2, the estimates show support for both parts of the natural trading partner hypothesis. Countries are significantly more likely to sign trade deals with other countries that are nearby, and (as Table 2 shows), those types of trade deals are more likely to be trade-creating.

Political and foreign policy considerations clearly do influence countries' choices of preferential trading partners. Pairs of democracies are about 6 percentage points (12 percentage points in Model 5) more likely to have a regional trade agreement than are dyads in which at least one country is not a democracy.

The statistically significant and positive coefficients on bilateral trade as a share of GDP in Models 2, 4, and 5 mean that countries with strong bilateral trade flows are more likely to have a regional trade agreement. This result is consistent with the natural trading partner hypothesis, which speculated that countries will be more likely to form regional trade deals with other countries that are already large trading partners. The result could also, of course, be due to reverse causality if the regional agreements are successful in increasing bilateral trade flows. This paper estimates an instrumental variable probit model later in this section to try to help sort out the causality question.

Many of the estimated coefficients for the control variables in Table 3 are similar to results found by Baldwin and Jaimovich (2012). Just as in Table 3, they found that countries are more likely to have regional trade agreements if they were nearer geographically, had strong bilateral trade flows, had similar government types, and had similar levels of per-capita income.

Table 4 presents instrumental variable probit estimation in order to deal with the possible endogeneity of bilateral trade flows in the RTA regression. The instruments used in the table are industry as a share of GDP in the two countries, services as a share of GDP in the two countries, the number of the two countries that are landlocked, and the countries' land areas relative to GDP. These are all variables that should influence how much bilateral trade there is between the two countries but should not directly influence the likelihood that they have a regional trade agreement.

As in Table 3, the estimates in Table 4 show that countries are more likely to sign regional trade agreements if the trade deal will generate high levels of trade creation and reverse trade diversion but low levels of trade diversion. With one exception, the coefficients remain statistically significant at the 1% level. Only the coefficient estimate on trade diversion in Model

2 is no longer statistically significant. This drop in statistical significance is because the standard error increased with the instrumental variables estimation technique. The magnitude of the coefficient on trade diversion is more than twice as large as the equivalent coefficient estimate in Table 3.

The results in Tables 3 and 4 suggest that governments have done a good job thus far in signing trade deals that are likely to raise welfare in their countries. This conclusion is similar to the one in Martin, Mayer, and Thoenig (2012) that estimated RTA trade gains for a dyad increase the probability that an RTA is in force. Notice that this conclusion is not simply due to the fact that countries sign trade deals with other countries that are close geographically and are therefore "natural trading partners." Higher trade creation and lower trade diversion increase the odds of a pair of countries having a regional trade agreement even after the geographical distance between the countries is controlled for in the regression. It is also true that countries that are near each other are more likely to sign trade deals even after you control for the likely trade creating and trade diverting effects of the agreement. That suggests that the effect of proximity on free trade agreements is due to political considerations or other factors that make trade deals more likely to occur between countries in the same region. The effect of proximity on RTA formation is not due to the fact that nearby countries trade more and are thus more natural trading partners.

A consideration in any empirical analysis is omitted variable bias. For the key results in this paper, the concern would be that unobserved factors increase both the probability that a pair of countries will sign a regional trade agreement and the likelihood that such a deal will be primarily trade creating. One possible omitted factor might be the historical level of cooperation or conflict between the pair of countries. Pollins (1989) found that countries with greater bilateral cooperation also tended to trade more with each other, or in a phrase dating back at least

to Gini (1938), that "trade follows the flag." Other recent research (Keshk, Pollins, and Reuveny, 2004, for example) has also found that better bilateral cooperation and less conflict raises trade. Martin, Mayer, and Thoenig (2012) show that country pairs with a higher frequency of past wars are more likely to sign RTAs. Thus, conflict or cooperation between countries is related to both their trade flows and to the likelihood that they agree to a regional trade deal.

There are two reasons why omitted variables such as unobserved bilateral cooperation are unlikely to explain the results found in this paper. First, the key results are consistent across all the models estimated even when bilateral trade flows are controlled for. The results also remain consistent if the average MFN tariff rate of the two countries is included in the regressions.[10] Thus, the estimation shows that holding bilateral trade (and tariffs) constant, agreements that are more trade-creating and less trade-diverting are more likely to have been approved. Second, it is unlikely that omitted variables are correlated with the projected trade impacts of a preferential agreement in such a way as to generate a positive correlation between RTA formation and the trade creation measure and a negative correlation between RTA formation and the trade diversion measure. As equations (2) and (3) show, projected trade creation, trade diversion, and reverse trade diversion all rise with the bilateral trade flows between the two countries and with the MFN tariff rates in the countries. Unobserved factors that drive up either MFN tariffs or bilateral trade flows would increase all three of those RTA trade effects. If those unobserved factors also raise the probability of RTA formation, they would tend to create a positive correlation between all the RTA trade effects and the probability that an RTA exists. Thus, it is difficult to conceive of a story in which omitted variables cause trade creation and reverse trade

[10] The trade creation, reverse trade diversion, and new trade diversion measures from equations (2) and (3) depend on industry-level trade flows, tariffs, and elasticity estimates.

diversion to be positively correlated with RTA formation while simultaneously causing new trade diversion to be negatively correlated with RTA formation.

5. Conclusion

The theoretical literature on which countries should tend to form regional trade agreements provided conflicting predictions. Politically, there are some arguments that trade diverting agreements are more likely to be approved than trade creating ones (Krishna, 1998). Trade creation harms domestic firms, and thus can lead to lobbying against the trade deal, while trade diversion does not harm domestic producers. The natural trading partner hypothesis is that countries will tend to form preferential trade agreements that are trade creating. That prediction was based on the logic that countries will tend to sign trade deals with partners that are in their own region of the world, and that such trade deals are better, on average, than deals signed between countries that are far away from each other.

This paper finds evidence against the argument that trade diverting agreements are easier politically to get approved. Instead, the trade diversion an agreement would generate significantly reduces the probability that the pair of countries will sign a regional trade deal. The natural trading partner hypothesis fares better in the estimates. Countries do tend to form trade agreements with other nearby countries, and such agreements do tend to be more trade-creating. The results in this paper suggest that countries do more than just accidentally form trade-creating partnerships because of proximity, however. Even after you control for geographic distance between countries, the estimated trade creation and reverse trade diversion a regional trade agreement would generate increase the likelihood that the RTA is in force in 2013 while trade diversion reduces this likelihood. While trade diversion potentially reduces welfare, both trade

creation and reverse trade diversion increase welfare in the absence of any other distortions. The estimates in this paper are thus consistent with the conclusion that governments are concerned about the welfare of their citizens and are influenced by the likely trade impacts of the different regional trade agreements they might consider.

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Figure 1: Export supply and import demand model of trade flows

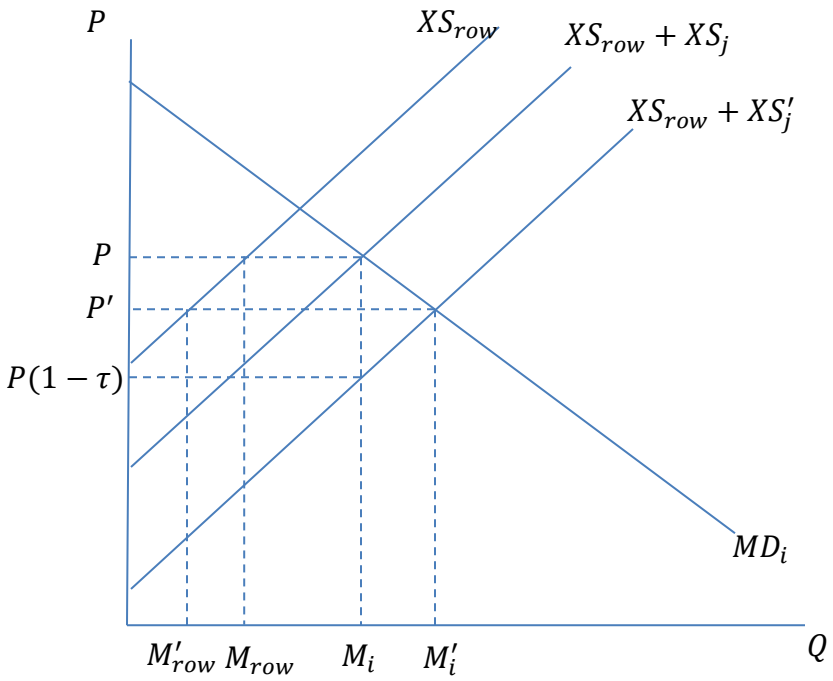

Table 1: Means and definitions of variables

Variable	Definition	Source	Mean
Regional trade agreement	=1 if pair of countries have a regional trade agreement in 2013	WTO.org	0.260
Trade creation	Estimated trade creation if countries form a regional trade agreement	Magee (2017)	0.112
Reverse trade diversion	Estimated reverse trade diversion if countries form an RTA	Magee (2017)	0.604
Trade diversion	Estimated trade diversion if countries form an RTA	Magee (2017)	0.448
Trade creation, % total imports	100*trade creation / sum of two countries' total imports	Magee (2017)	0.019
Reverse TD, % imports	100*reverse trade diversion / sum of two countries' total imports	Magee (2017)	0.107
Trade diversion, % imports	100*trade diversion / sum of two countries' total imports	Magee (2017)	0.071
Trade creation, % GDP	100*trade creation / sum of two countries' GDPs	Magee (2017)	0.006
Reverse trade diversion, % GDP	100*reverse trade diversion / sum of two countries' GDPs	Magee (2017)	0.036
Trade diversion, % GDP	100*trade diversion / sum of two countries' GDPs	Magee (2017)	0.019
Net trade creation	Trade creation + reverse trade diversion – trade diversion	Magee (2017)	0.268
Net trade creation, % of imports	100*Net trade creation / sum of two countries' total imports	Magee (2017)	0.055
Net trade creation, % of GDP	100*Net trade creation / $(GDP_1 + GDP_2)$	Magee (2017)	0.023
Trade deficit	$\frac{\lvert Imports_{12} - Imports_{21}\rvert}{(Imports_{12} + Imports_{21})}$	UN Comtrade data	0.600
Difference GDPPC	$\frac{\lvert GDPPC_1 - GDPPC_2\rvert}{(GDPPC_1 + GDPPC_2)}$	World Development Indicators, World Bank	0.568
Difference GDP	$\frac{\lvert GDP_1 - GDP_2\rvert}{(GDP_1 + GDP_2)}$	World Development Indicators, World Bank	0.702
# other RTAs	Number of RTAs the two countries have (not including with each other)	Author's calculations	75.271
Contiguous	=1 if countries share a land border	CEPII database	0.022
Common language	=1 if countries share a common official language	CEPII database	0.146
Natural	Natural log of $(1/distance)$	CEPII database	-1.821
Remote	Average log distance with rest of world, 0 if different continents	Calculated from distance data at CEPII database	10.982
Both democracies	=1 if both countries have a polity score of at least 6	Created from Polity IV project data	0.566

Trade/GDP	$\frac{100 * (Imports_{12} + Imports_{21})}{(GDPPC_1 + GDPPC_2)}$	Author's calculations	0.078
Log GDP	$= \ln(GDP_1) + \ln(GDP_2)$, GDP in billions of dollars	World Development Indicators, World Bank	8.300

Table 2: Net trade creation and the natural trading partner hypothesis

	Model 1	Model 2	Model 3
Log distance	-0.527 ***	-0.109 ***	-0.042 ***
Contiguous	3.968 ***	0.663 ***	0.295 ***
Log GDP	0.051 ***	0.005 ***	0.002 ***
Number of other RTAs	0.016 ***	0.002 ***	0.001 ***
Constant	-0.492 ***	0.033 *	0.021
Observations	6786	6786	6786
R-squared	0.089	0.235	0.268

Model 1: The dependent variable is net trade creation in billions of dollars

Model 2: The dependent variable is net trade creation as a % of the two countries' total imports

Model 3: The dependent variable is net trade creation as a % of the two countries' total GDP

Table 3: Factors affecting RTA formation

	Model 1	Model 2	Model 3	Model 4	Model 5
Trade creation	0.674 ***	0.651 ***	2.269 ***	2.122 ***	2.107 ***
Reverse TD	0.414 ***	0.382 ***	1.247 ***	1.148 ***	1.191 ***
Trade diversion	-0.208 ***	-0.231 ***	-0.670 ***	-0.830 ***	-0.585 ***
Trade deficit	-0.066 ***	-0.064 ***	-0.069 ***	-0.066 ***	-0.098 ***
Difference GDPPC	-0.059 ***	-0.058 ***	-0.064 ***	-0.061 ***	-0.023
Difference GDP	-0.030	-0.028	-0.026	-0.025	-0.008
# other RTAs	0.008 ***	0.008 ***	0.008 ***	0.008 ***	
Contiguous	0.224 ***	0.213 ***	0.246 ***	0.222 ***	0.235 ***
Common language	0.054 ***	0.057 ***	0.058 ***	0.062 ***	0.016
Remote	0.029 ***	0.029 ***	0.030 ***	0.030 ***	0.020 ***
Natural	0.099 ***	0.098 ***	0.099 ***	0.099 ***	0.184 ***
Both democracies	0.058 ***	0.058 ***	0.061 ***	0.061 ***	0.121 ***
Trade/GDP		0.094 *		0.133 ***	0.140 **
Observations	6786	6786	6786	6786	6555
Country dummy variables	No	No	No	No	Yes

Models 1 and 2: Expected trade creation, trade diversion, and reverse trade diversion are measured relative to the total imports of the two countries

Models 3, 4 and 5: Expected trade creation, trade diversion, and reverse trade diversion are measured relative to the total GDP in the two countries

Table 4: Factors affecting RTA formation, instrumental variable probit estimation

Variables	Model 1	Model 2
Trade creation	4.412 ***	12.594 ***
Reverse trade diversion	2.582 ***	6.811 ***
Trade diversion	-0.736 ***	-1.893
Trade deficit	-0.277 ***	-0.263 ***
Difference GDPPC	-0.266 ***	-0.251 ***
Difference GDP	-0.199 **	-0.100
# other RTAs	0.034 ***	0.032 ***
Contiguous	1.395 ***	1.012 ***
Common language	0.176 **	0.182 **
Remote	0.114 ***	0.119 ***
Natural	0.437 ***	0.366 ***
Both democracies	0.266 ***	0.255 ***
Trade/GDP	-1.932	-1.235
F-statistic, instruments	21.37 ***	32.05 ***
Observations	6786	6786

Instruments for bilateral trade flows: industry as share of GDP in the two countries, services as share of GDP in the two countries, number of the two countries that are landlocked, total land area relative to total GDP in the two countries

Model 1: Expected trade creation, trade diversion, and reverse trade diversion are measured relative to the total imports of the two countries

Model 2: Expected trade creation, trade diversion, and reverse trade diversion are measured relative to the total GDP in the two countries