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Domestic Determinants of Preferential Trade Agreements

J Vomocil

Clemson University, jnathanvomocil@gmail.com

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Domestic Determinants of Preferential Trading Agreements

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
In Economics

by
J Nathan Vomocil
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Scott L. Baier, Committee Chair
Michal Maria Jerzmanowski
Patrick L. Warren

ABSTRACT

The purpose of this paper is to expand previous research on the economic determinants of preferential trade agreements, both by using a updated data set and also by including new potential non-trade and domestic explanatory variables. I find that the differences in primary market sectors of trading partners, the differences in level of infrastructure, the size of countries' agricultural sectors, and differences in countries' degree of democratization are all significant factors in bilateral PTA creation, along with several other variables. While results may not be as strong as in earlier studies, there are several plausible explanations for this, and the inclusion of these domestic factors adds a non-trivial amount of predictive power over the trade-only gravity models used in previous research.

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1. Introduction

Preferential Trade Agreements, henceforth called PTAs, has become the subject of a great deal of debate and research over the past two decades. While hardly a single credible economist would debate the merits of freer trade, and the vast majority of the relevant literature shows that broad multilateral trade liberalization (MTL) initiatives like the WTO or its GATT predecessor have the greatest welfare-creating potential for international trade, PTAs are becoming increasingly popular as the *variété du jour* of trade liberalization. The PTA puzzle is more difficult to solve than its multi-lateral brother mainly because PTAs are inherently discriminatory towards third parties. Because they combine some aspects of liberalization with other protectionist traits—both fundamentally, within treaties, as well as vicariously, against non-member countries—it is not as straightforward a task to determine their ultimate effect on welfare as it is with a MTL solution.

Furthermore, trade liberalization is hardly a guaranteed outcome, even on a bilateral basis, and countries must dedicate a portion of their non-infinite resources towards completing these agreements. Does this divert resources and incentives away from broader multilateral negotiations, as Limao (2007) claims? Or does it help developing countries signal their commitment to domestic reforms while at the same time providing them with insurance against potential global trade wars, as Fernandez & Portes (1998) suggests? Perhaps the tendency of

PTA formation to divert attention and resources away from MTL negotiations is merely a temporary, transitional phase a la Bagwell & Staiger (1997)? As a result of this confusion, recent research on PTAs has overwhelmingly focused on the effects these deals have on member and world welfare as well as their potential effects on the ability of nations to conclude successful future rounds of MTL talks. While this is clearly an important area of inquiry, understanding the dynamics of PTA creation is just as important, yet it receives far less focus.

The rationales and rhetoric of PTA formation have been tackled numerous times from a political economy standpoint, yet very few papers have tried to establish empirically what factors, trade-related or otherwise, influence the formation of an actual PTA. Following in the footsteps of Baier & Bergstrand (2004) (henceforth called BB), this paper will focus on those factors, as opposed to the economic impacts that PTAs cause. Included in this study are typical gravity model variables as well as several non-trade and political factors. I find that the generalized Krugman-FSW model employed by BB continues to perform well. I also find evidence that a number of other non-trade variables have a significant effect on the likelihood of a PTA, though their effects individually are not as strong as the trade factors. These variables include the differences in primary market sectors of trading partners, the differences in level of infrastructure, the size of countries' agricultural sectors, and differences in countries' degree of democratization.

The remainder of the paper is outlined as follows. Section 2 provides the motivation for this paper. Section 3 discusses several issues with the econometric methodology and data. Section 4 contains the results of the analysis, while section 5 interprets the results. Section 6 concludes.

2. Motivation and Literature Review

The global shift from protectionism towards free trade is a fairly modern phenomenon, and a great deal of progress has been made on that front since the conclusion of WWII. Since that time, many trade liberalization negotiations have been conducted under the direction of the GATT, which was supplanted by the WTO in 1994. Taken together, the GATT and WTO have been quite successful, allowing member nations to reduce their tariffs by over 90% since their inception. However, recent dissatisfactions over the handling of certain conflicts and issues particular to the developing world have encouraged some members to look towards bilateral PTAs as an alternative to the MTL solution offered by the WTO. The first modern PTA was inked in 1958, and the relative explosion of PTAs in recent years began the late 1990's. While there is a general consensus as to the conditions under which a PTA could raise or lower member and world welfare, there is unfortunately no such consensus as to what set of assumptions is appropriate for the real world. While the majority of the literature supports broad liberalization over a regional approach involving PTAs (see Vamvakidis 1999 for

example), some critics argue that PTAs can be used to push along a stagnant multilateral process through “competitive liberalization” (Evenett & Meier 2006). Even if they truly are a second-best option, it is fairly certain at this point that PTAs will continue to help form the international trade landscape for years to come, and any future WTO rounds will have to deal with that reality.

However, as soon as one accepts that PTAs will continue to be an important economic reality, then the dearth of researched aimed at evaluating PTA formations independently of their economic impact becomes troubling. The reason such research matters is because international trade is not a zero-sum game, and the economic integration and investment that occur during periods of preferential treatment lead to permanently increased levels of trade, even if other countries can eventually gain an equal footing, tariff-wise (Freund 2000). In other words, the order in which PTAs are created has a real impact on all parties involved, even if the rest of the world ultimately achieves global free trade through multilateral means. The importance of examining this problem empirically should be obvious, as an empirically-based understanding of PTAs can not only lead to better predictions about which countries will form them, but might also provide further insight into which issues should take center stage in future multilateral talks. This paper aims to help bridge this gap in knowledge.

To begin, what variables have been suggested as possible motivators in previous work? Building off the theoretical work done in Krugman (1991) and Frankel et al. (1995, 1996, & 1998), BB offers strong empirical support for six

factors that influence PTA creation. The first factor, distance between trading partners, verified Krugman's original assertion that transportation costs would have a primary role in determining whether PTAs were, on the whole, trade-creating or trade-diverting. The authors found that the larger the distance between countries, the smaller the potential welfare gain from a PTA, and therefore, the likelihood of a PTA decreases as total distance between partners increases. Secondly, the degree to which a pair of trading partners is physical removed from the rest of the world was also found to be important. This result relies both on the relative differences in intra- and inter-continental transportation costs as well as the idea that as the average distance between countries A and B and their other trading partners grows, the chance that a PTA between A and B will divert trade from those other countries shrinks. After accounting for transportation costs, the interplay between the absolute and relative sizes of GDPs was also found to be a significant factor in PTA creation. On the one hand, the larger the average size of GDP between partners, the larger the welfare gain from a PTA will be, natural trading partner or not. On the other, if one country's GDP is vastly larger than its partner, less trade growth will result from removing trade barriers than if they were more similar in size. The last factors outlined by BB deal with the traditional trade model concepts of labor/capital ratios and comparative advantage. Put as simply as possible, the wider the difference in relative factor endowment between countries, the more able that pair of trading partners will be to realize the benefits of the comparative

advantage through specialization. This result was found to be sensitive to inter-continental transportation costs, however. Finally, the larger the difference of relative factor endowments between a country pair and the rest of the world, the less likely a PTA becomes because the trade diversion from the rest of the world to the partner country decreases the potential welfare gain (see Venables 2003 for more in depth discussion of this issue).

Other suggested variables that might affect whether a country enters into a PTA include the varying degrees of legal protection between partner countries, specifically with regards to environment, labor, and intellectual property rights (Hefeker 1996), the desire to lock in hard-earned domestic policy reforms (Whalley 1998), the desire to utilize welfare-enhancing yet (sans PTA) time-inconsistent liberalization policies (Fernandez & Portes 1998), the idea that certain types of PTAs can enhance bargaining power with third-parties (Das & Ghosh 2006), and the attractiveness of using PTAs as a foreign policy reward for political allies, especially in the case of so-called North-South arrangements (Limao 2007). Rampant protectionism in the agricultural sector has also been cited as a persistent stumbling block to liberalization, both on the multi- and bi-lateral levels (Hillman 1978, Francois et al. 2005, Anderson & Valenzuela 2007). Beyond these, any other factor that might arouse interest from an exporter or foreign investor could also improve the chances of a PTA because of the potential political pressure that would be applied to liberalize trade with the country in question (Grossman & Helpman 1995).

All of these potential factors have been thoroughly evaluated in the theoretical sense, but there are several practical issues which make them difficult to evaluate empirically. For instance, with regards to labor and environmental laws, the disparity between existing laws and their enforcement can be quite pronounced, which turns what should be a fairly easy comparison of legislation into a prolonged field exercise in data collection. Even beyond the problems resulting from lax enforcement or even the occasional cover-up, environmental and labor law stipulations in PTAs are more often than not included at the behest of import industries in developed countries, who hope to avoid increased competition by forcing expected standards to be set above those that exist in the partner country. The import industries can then demand that their government take action to correct the “violation” through protective measures (Hefeker 1995). Furthermore, neither can one simply compare whether or not PTAs contain text stipulating minimum standards because the inclusion of these types of clauses has an inherently ambiguous effect that differs from treaty to treaty¹. Even if the inclusion of such text was indeed the variable of interest², rather than the actual differences in labor or environmental conditions that inspired the inclusions, one could not determine the net effect on the probability of PTA creation without comparing existing PTAs that contained such language against failed PTAs with

¹In the sense that they will appease one country's importers while upsetting the other country's exporters, with the eventual equilibrium dependent on which country has more bargaining power.

²Fernandez and Portes 1998 suggests that the exclusion of sensitive sectors from PTAs can relieve enough political opposition to make passage feasible.

similar stipulations³. Given these difficulties and the scope of the present paper, the decision was made to ignore labor and environmental differences as potential non-trade factors affecting PTA creation, despite the incredible likelihood that they do have a significant impact.

Evaluating the use of PTAs as a foreign policy tool is similarly problematic, specifically because they are inherently “unnatural.” To be enticing as a reward, a proposed PTA falling in this category would need to be unlikely to pass on its own trade-based merits, else it could hardly be considered a reward. These PTAs also tend to be overwhelmingly North-South type arrangements, and they usually involve the larger country demanding some sort of side payment in return for increased access to their markets (Perroni & Whalley 2000). To top it off, this naturally creates a situation where the large countries prefer to raise their MFN tariffs, in order to improve their ability to extract concessions from the smaller countries (Limao 2007). While not in the scope of this study, it is also entirely possible that a government, such as the US, could place sufficient importance on achieving its foreign policy goals through trade means that it would accept PTAs that were clearly welfare-reducing in a strictly economic sense. Such concerns are not the purview of the paper however, and no attempt will be made here to provide explanation for something so conspicuously political in nature.

³As an example, consider the passage of NAFTA. The side agreements on labor and the environment that accompanied NAFTA gave Congress the political cover to approve its passage, something unlikely to have happened without them (Hufbauer & Schott 2005). On the other hand, insisting on such stipulations in an agreement with a country that vehemently opposes them, e.g. India (Hensman 1996), would likely torpedo trade negotiations. Furthermore there are many cases where a PTA might exist without requiring them, e.g. CUFSTA, or conversely, there are many cases where a hypothetical PTA that might require them does not exist for entirely distinct reasons, e.g. a US-Cuba PTA.

3. Econometric Model and Data Issues

For this purposes of this paper, I employ a qualitative choice model, as outlined by McFadden (1975, 1976). Because it is assumed that governments will only form a PTA if both parties can expect an increase in utility under the arrangement, let y^* equal utility as given by

$$y^* = \beta_0 + \beta x + e$$

where β is a vector of parameters, x is a vector of explanatory variables, and e is the error term, assumed to be independent of x and following a normal distribution. Because both countries must benefit from a PTA for it to be created, y^* is also given by

$$y^* = \min(\Delta U_i, \Delta U_j)$$

Obviously, utility is unobserved, and therefore an indicator variable must be defined. The indicator for this study, pta , carries the value of 1 (indicating y^* is positive) if the partner countries have a PTA and 0 otherwise (indicating y^* is negative or zero). The probability of a PTA, P , is then given by

$$P(p\tau a=1) = P(y^*>0) = G(\beta_0 + \beta x)$$

where G is the standard normal cumulative function.

For this study, a table was constructed from 146 nations, which when paired exhaustively, form 10535 possible two-country combinations. Each possible country pair then becomes one observation within the data set. The dependent variable in this case, pta , indicates whether or not each country pair

has a preferential trade agreement in force during the year 2008, with 1 indicating the existence and 0 the lack of such a PTA. While the actual PTAs being examined were completed at many different times, sovereign countries may choose to ignore or renege on the terms of a previous deal. Thus the existence of an active PTA is taken as continued mutual acceptance of the previously concluded terms. Out of the possible 10535 possible trade partnerships in this dataset, 1002 of them had an active PTA during the year 2008.

For simplicity purposes, it is assumed that all trading countries have access to the same transportation technology and that the primary factor influencing transportation costs will be the bilateral distance between trade partners⁴. Therefore, the great circle distance between the major economic center in each country, determined using Linnemann (1966), was used to define distance for the purposes of this study. The RHS variable *distance* is the natural log of the inverse of these great circle distances between each member of any given country pair. To allow for potential comparison, the *remote* variable was constructed in the same manner as in Baier & Bergstrand (2004), namely:

$$remote_{ij} = dcont_{ij} \times \left\{ \left[\log \left(\sum_{k=1, k \neq j}^N distance_{ik} / N-1 \right) + \log \left(\sum_{k=1, k \neq i}^N distance_{jk} / N-1 \right) \right] / 2 \right\}$$

This measures the average of the mean (log of) distance between country *i* and all its trading partners with the mean distance between country *j* and all its

⁴These may be unrealistic assumptions (Anderson & Wincoop 2004), but without them the problem becomes almost intractable.

trading partners, excluding j and i respectively, multiplied by $dcont$, which is a binary variable with a value of 1 if the partner countries are both located on the same continent and 0 otherwise. Thus, for natural trading partners, the value of $remote$ will be a measure of the average distance away from other trading partners, while for country pairs on different continents, the value of $remote$ will be 0.

All economic sector data was taken from the World Bank Indicators. The $rail$ variable was taken from the CIA World Factbook, and the democracy variables are from the Economist Intelligence Unit's annual Democracy Index. One important point, however, is that the data used for the RHS variables are generally from the year 2000. This was done to avoid potential endogeneity because many of the PTAs in this study have existed for decades. For example, the formation of a PTA will influence future trade between partners, which influences their future economic growth. If a PTA was formed in the 80's, then factors like GDP in the year 2008 could very well be endogenous.

4. Numerical Analysis and Empirical Results

Hypothesis 1. In the long run, the factors examined in BB, namely distance, remoteness, total size of GDP, and difference in size between partners' GDP, should remain the most important variables regarding PTA creation.

Considering the implications of Krugman's and FSW's theoretical work, as well as the empirical work of BB, it seems highly unlikely that secondary concerns will ever overtake trade-related issues when considering whether to enact a new PTA unless we relax the assumption that governments are acting in the best interests of the general populace and not concerned private interests⁵. For example, if PTAs are thought of as attempts to remove trade barriers between countries, the physical distance between countries is one barrier to international trade that can never be removed. Even newer, lower-cost transportation technologies will not overcome it, as any new technology could be applied to all trade partners equally⁶. While absolute transportation costs will surely fall as technology improves, the simple laws of physics demand that it will always be cheaper to move a good 1000 miles than 10,000. Similarly, the reasons why absolute and relative GDP sizes affect potential gains from trade will not disappear even if governments decide to abandon trade liberalization completely and move back to mercantilism.

The results of the trade-only model specification can be seen in Table 1 in the appendix. By either of the pseudo-R² or percent-correctly-predicted metrics, the results are fairly strong. While it is true that the results of the same specification in BB were considerably stronger, there exist several possible explanations for this.

⁵Despite Goldberg and Maggi (1999) and other similar studies, governmental preferences can change as surely as consumer ones, and what was true of 1999 may no longer apply in the future. Therefore, this remains an assumption and not a foregone conclusion.

⁶However, it may be that neither intra- nor inter-continental transportation costs are uniform between countries (Anderson & Wincoop 2004). Relaxing this assumption greatly increases the difficulty involved in the estimation but could provide even better predictions than the current model.

Obviously, the most tempting explanation to assume is that secondary issues have made considerable creep into the decision-making processes of governments during the intervening 12 years. There is considerable anecdotal evidence to support this. The United States, for example, has been fairly overt in expressing its desire to use PTAs as tools in achieving a varied assortment of diverse goals, from promoting domestic stabilization in troubled countries to rewarding specific countries for aiding with US domestic policy goals as well as prodding developing countries into improving their business climates for foreign direct investment (Evenett & Meier 2006). Furthermore, only three of the seventeen countries that have concluded PTAs with the US (Canada, Mexico, and Singapore with a pending deal with Korea to be the fourth) are with any of its top 15 trading partners, a group with whom the US does nearly 75% of its combined international trade (US Census Bureau 2011).

Some of the remaining PTAs are unabashedly and overtly political in nature, such as the PTA formed with Oman. At the time of creation, Oman was just 88th among all US trading partners in terms of combined trade volume, accounting for barely .04% of US imports and exports (Bolle 2006). Considering the size, distance, and intercontinental nature of the trade partnership, it would be practically impossible to assert that such a PTA was motivated by trade considerations ($\Pr(\text{PTA}=1)$ given specification 1 is only .016). Thankfully, one need not guess at the US's intentions, as a Congressional Research Service report from 2006 very clearly states that the United States' primary motivation for

enacting the PTA was to reward Oman for its support of the US in the global war on terror, i.e. “aiming to fight terrorism with trade” (Bolle 2006). Of course, the United States is an outlier in nearly every trade-related category, so it is not entirely unreasonable to expect them to be in this one as well. The question then becomes if other countries are following suit, as well as how much these considerations might affect the US’ decision-making process.

Another equally likely explanation for the decrease in strength-of-fit lies in the size and qualitative differences between this data set and the one employed by BB. A threefold increase in the number of countries included, resulting in a 750% increase in the total number of observations, combined with the fact that this data set also includes countries that have formed no PTAs at all could also easily account for the weaker strength-of-fit when compared to the results of BB. It is difficult to tell which of these factors (policy creep or unrepresentative sampling) is largely responsible, but limiting the results of this specification to only those countries that were included in the original study by BB has surprising results. For example, the BB-only country restriction leads to a somewhat higher pseudo- R^2 than using the full data set, but it remains well below the original estimates reported in BB. This is suggestive that both factors are playing a role in these results, but further research will be required to determine exactly how and to what extent the trade-model variables’ influences on PTA formation have changed over the years.

Hypothesis 2. Countries will be more likely to form PTAs with other countries that share similar levels of infrastructure.

Regardless of any philosophical preference for MTL over PTAs or vice versa, no country can marshal an infinite amount of resources towards concluding trade negotiations with other countries. This means that all countries must prioritize who they engage in trade talks. Taken together with the fact that poor infrastructure can impose very real costs on businesses operating within a country's border (Limao & Venables 2001), it stands to reason that everything else being equal, businesses will pressure their governments to deal with countries that have the best infrastructure available. However, since PTAs are conducted on a bilateral basis, that attraction must be mutual, i.e. if Country A has a poor infrastructure and would love to trade with a Country B that has a well-developed one, but that country may not share similar feelings about their counterpart with the underdeveloped infrastructure. While it is true that poor infrastructure and easy sources of inexpensive labor often walk hand in hand, *ceteris paribus*, any producer will prefer the best infrastructure available in order to smooth the flow of physical capital and goods to and from the partner country. It follows logically, then, that if infrastructure does indeed influence PTA creation, countries will have the most success dealing with other countries of similar quality infrastructures, after accounting for the primary concerns of distance and economic sizes of trading partners.

Several measures were considered to capture the essence of infrastructure quality, including quality of and access to an electrical grid, access to improved water sources, port quality, road quality and quantity, petroleum and LNG pipeline existence, and the extent of the rail network, but unfortunately, despite that each of these variables' probable importance on how foreign investors might grade the quality of a country's infrastructure, the very high degree of colinearity between most of these variables means that only one could be chosen for inclusion. Rail was chosen over the other three variables⁷ because it had the lowest proportional standard error, as well as the fact that building rail lines implies a level of sophistication in infrastructure that paved roads does not. Given the importance of transportation costs that has already been established, it is unsurprising that differences in total rail lines would be a significant and strong factor in PTA creation. While the marginal effect shown in Table 2 seems very small, it should be noted that *rail* is measured in kilometers and not the natural log of distance⁸, and a 1 km addition to existing rail lines would obviously not change much by itself.

Hypothesis 3. Economies that are predominantly focused in the service sector will be more likely to form PTAs.

Service sector jobs are, in general, more difficult to relocate than manu-

⁷The total length of roads, paved roads, and pipelines were all tested individually in addition to total rail lines and found to be significant. However adding more than one of these variables quickly decreased the significance due to the high degree of colinearity between them.

⁸This is due to the way Stata treats arbitrarily large numbers, like negative infinity, and the fact that there were many true zero observations as a fair number of countries have no rail at all.

facturing or agricultural ones. Service sectors also tend to face less direct foreign competition than the manufacturing and agricultural sectors, e.g. it would be hard for a dentist in China to outcompete one in the US. Consequently, service sector industries are less likely to be shielded by the government with tariffs and other measures. This means that even after liberalization, industries within the service sector will not feel the pains of increased international competition as acutely as the manufacturing and agricultural sectors will. The lower risk of outsourcing and competition means less political opposition which in turns means higher chances of success in concluding PTA negotiations.

To capture this effect, countries within the data set were divided broadly by their largest market sector (agriculture, industry, or service), expressed in terms of the value added as percentage of total GDP⁹. Country pairs where both partners had at least a plurality of production in the service sector were grouped together by the *SRSR* dummy variable. Originally, the plan was to have this variable be defined as equal to 1 if just one (or both) of the two countries was a service economy. However, this plan was quickly scrapped as over 10000 of the nearly 10600 pairs would have been included. This variable was also highly insignificant when included in the models due to its extremely low variance (See Table 3 for cross-tabulations of the *SRSR* variable and *pta*.) As can be seen from the results in Tables 1 and 2, the *SRSR* dummy is significant and moderately strong, in that at the mean, a pairing of two service economies would

⁹In a separate test, economies were defined by percent of total employment, not percent of GDP. The results were qualitatively the same and roughly similar in terms of marginal effects, despite widespread changes in classification among the industrial and agricultural countries.

be about 2% more likely to have a PTA formed than any other pairing of economy types. This is fairly impressive when one considers that the average incidence of PTA existence for the entire data set is only 9.47%.

Hypothesis 4. Economies with large portions of GDP focused in the agricultural sector will be less likely to form PTAs.

Agriculture is a notoriously distorted market; so distorted, in fact, some have suggested that gains-from-trade in agricultural commodities may not exist at all, despite fairly large trade flows (Shmitz et al. 1986). Furthermore, in situations where governments are supplying direct subsidies to exporters, there is actually an incentive for producers to fight to preserve the artificial rents from protectionism that a potential PTA would destroy (Lusztig 1998). Thus, the idea behind this hypothesis is not that the production of agricultural products itself leads to retarded PTA formation but rather that the widespread use of protectionist measures to shield agriculture, coupled with the subsequent pain of their elimination, are what ultimately make countries with large agricultural sectors abstain from liberalizing. Obviously, the ideal variable to test this hypothesis would be a measure of how big the distortion each country was imposing with their protectionist measures. While this is theoretically possible, it proves to be impossible in practicality, given the scope of this research. More often than not, agricultural products are protected by non-tariff measures like import quotas, licensing requirements, export subsidies, minimum import prices, monopolistic state trading, import calendars, and sanitary restrictions (Hillman

1978). This can turn any attempt at getting an accurate measure of market distortion for a single country into a struggle; completing 146 such evaluations becomes a truly Herculean effort. Therefore, a more tractable measure was required; because agricultural distortions are so widespread, among developed and developing countries alike, the decision was made to simply account for the size of the agricultural sectors in each country.

The logic behind this decision is that as the importance of the agricultural sector grows in terms of GDP, the more likely a country will be to place prohibitive protectionist measures on trade to compensate for the global market distortions that exist. While the WTO does allow for certain products to be exempted from the terms of a PTA between member countries, it still requires that “duties and other restrictive regulations of commerce are eliminated on substantially all the trade” between partner countries (WTO 2011). Thus if the previous assumption holds, as the agricultural sector of a country becomes larger, it also becomes more difficult to adhere to the WTO stipulations. Therefore if a country wants to maintain protectionist shields, they must do so on a wide MFN basis, and they will be less likely to grant preferential terms to a trade partner.

Of course, a sufficiently vague term like “large portion” leaves immense leeway for interpretation. Obviously, agricultural sector majorities and pluralities should be included in this group, but advances in modern, high-yield farming techniques allow developed nations to provide sufficient food for their citizenry

with only small portions of their respective GDPs dedicated towards farming. In fact, three of the largest “offenders” in agricultural protectionism, Japan, USA, and the EU, all have agricultural sectors that are less than 5% of their respective GDPs. This means that if some “critical value of agriculture” does indeed exist, it will certainly be smaller than 33.4% (the smallest possible plurality). A simple cross-tabulation (Table 4) of agriculture’s percent GDP share against the existence of a PTA reveals that even at the 5% level, the proportion of extant PTAs is considerably less than the total set average (4.5% of country pairs have a PTA versus 9.5% over the entire data set).

However, it takes two to tango, as the saying goes, and either country’s farm lobbyists could derail potential trade talks. Thus the decision was made to construct the agriculture variable in such a way as to distinguish between pairs where both partners have less than a certain percentage GDP share of agriculture and those pairs where at least one of the partners has the minimum percent or greater. For the purpose of this study, three cutoff values were tested: 5% 10% and 20%. Somewhat surprisingly, all three cutoff values were found to be significant simultaneously, which implies the problem starts small and gets progressively worse. The 5% group is by far the largest one, comprising nearly 90% of the total data set, yet the effect of agriculture on PTA formation is still quite pronounced. Even after accounting for the dominant sectors from each country, the effect is still very significant and some of the strongest marginal effects in the entire model, as can be seen in Table 2.

Hypothesis 5. Governments that share similar preferences for public welfare over private interests will be more likely to form PTAs.

The benefits of a PTA are reaped by the general public in a very generalized sense while the costs are acutely felt by all the previously protected (and potentially powerful) industries. Any forward-looking industries can be expected to lobby very diligently in order to keep their protected status at the expense of consumers. It follows, therefore, that any governments that place more emphasis on the public welfare over private interests will be more likely to form PTAs with other nations than ones that do not. As mentioned earlier, previous work by Goldberg & Maggi (1999) and Gawande & Bandyopadhyay (2000) suggest that the weight the US government places on consumer welfare is many times that of political contributions from industry sources. However, even the quickest glance around the globe would reveal that there is a huge amount of variation between nations' concern for public welfare. It is fairly unlikely that a Somalian warlord or North Korean dictator cares as much for consumer welfare as the typical first-world democratic regime. However, in many senses, this is a very problematic variable to quantify, and because not all countries have a system analogously similar to the United States, the Grossman-Helpman model may not even be applicable in all cases. Thus for the purpose of this study, it was decided to include the Economist Intelligence Unit's annual Democracy Index as a measure of governmental concern for the general public welfare¹⁰

¹⁰During the preliminary research for this paper, the bureaucratic costs of obtaining services, namely new electricity connections, and an index representing media censorship were used to test for this hypothesis. Both were significant but with weak marginal effects. Inclusion of the Democracy Index caused them both to become highly insignificant, indicating that the Democracy Index is a better choice to capture the effects of interest to this study, especially when considering the inherent validity issues with those two particular variables.

The Democracy Index focuses mainly on how well a government preserves the freedoms necessary to maintain a democracy, and very little on the actual form that a particular government may take. Thus, in the year of 2007 (the year of the Democracy Index data,) Great Britain scored very high while Jordan was only middling, despite both belonging to the constitutional monarchy archetype. Two different representations of this Index were included in the study to attempt to capture two potentially distinct effects that governmental preference might have on trade agreements. The first is simply the combined score of the country pair. Given the linear nature of the Index and its reasonably defensible weighting schema, adding the two scores together gives a fair representation of the amount of personal liberties a citizen within any given partnership might have. As can be seen in Table 1, increasing the average amount of personal liberties has a positive effect on PTA formation as well¹¹.

The second manifestation of the Democracy Index in this study was the absolute difference between two countries scores. The idea behind this variable is that while PTA creation is assumed to be based on economic principles and evaluations, their existence usually involves a political sell of some sort to convince enough legislators and/or citizens to pass the agreement into law. A perception of sameness between any two countries would only help to smooth over the inevitable bumps of trade negotiations, and thus increase the likelihood

¹¹In the Index, the scores range from 0 to 10, with 0 being extremely repressive and authoritarian, and 10 denoting the most open and free societies. Scores are based on 10 survey areas per category, with each question worth 1 point. The 5 major categories are then arithmetically averaged to give the overall country score.

of a PTA. Table 1 shows that this does seem to be the case, with significant and moderately strong results for both Index variables. Table 2 shows that both variables have reasonably strong marginal effects as well, with either variable being roughly as influential as the GDP effects from the trade model (though all the trade factors taken together are considerably stronger). These results corroborate those found by earlier research, such as Goldberg & Maggi (1999) that estimate that the US and other similar governments have very high preference for the general welfare.

Hypothesis 6. Certain factors may have experienced a change in importance over time.

As a matter of curiosity, several variables originally tested in BB were retested using appropriately updated data to see if their effects had changed at all. Shared common language, difference in military spending as a percentage of GDP, and difference in per capita tons of CO₂ produced were all included in the full specification and found to be significant. This is despite the fact that only the CO₂ variable was found to be significant in the original BB work. Interestingly, the military spending difference is reported in Table 1 as having a positive impact of PTA creation, which is to say, as the disparity in military spending (as a percent of GDP) increases, so does the probability of a PTA between those countries. The sign of this variable is most unexpected, yet there are several potentially plausible explanations for this. It could be driven by the increase in

North-South type agreements, or it may actually be that, neighboring countries that spend similar amounts on military defense may see each other more as potential military threats than two countries with widely divergent military spending would. This might affect their desire for diplomacy and hamper talks. The effect of CO₂ is largely unchanged from BB, and the fact that common language was found to be significant is no surprise either, as such a result is predicted by Hutchinson (2005).

5. Interpreting the results

One important caveat to remember when using a probit model is that the reported regression coefficients are not the estimated effects of the explanatory variables on probability. Rather, they are the estimated effect on the probit index of the model, something that is rarely of interest. Thankfully, any modern statistics package has the ability to translate these estimates into the marginal effects that the explanatory variables have on the probability of a specific outcome in the dependent variable. Further care should be taken to remember that since the cumulative normal distribution is not linear, the point at which the marginal effects are calculated will affect their magnitudes and even potentially their relative strengths. The marginal effects of the different model specifications, all evaluated at the means, can be seen in Table 2. For example, column one shows the basic trade-only model originally appearing as Specification 4 in BB.

From the table, it can be seen that a one unit increase in the log of distance will decrease the probability of a PTA by approximately 5% at the mean of log distance (8.7 or ~6000 miles). In the final column, which represents the full model, one can see that the estimated effect of either country having an agricultural sector larger than 5% of GDP decreases the probability of a PTA by 5%, growing to 8% with an agricultural sector at 20% of GDP. Since the average occurrence of PTAs is only around 9%, agriculture appears to be every bit the tripping stone that many authors have previously claimed.

Table 3 represents how the addition of all the domestic variables improved the predictive power of the model. Both models are relatively good fits in terms of percent-correctly predicted. While the model with non-trade factors included only adds about 1% to the total predictive power, this result is somewhat misleading. Because the total number of PTAs is quite small compared to N, even a model with no predictors would still correctly predict 88% of all cases. Therefore, the sensitivity of the model and positive predictive value are both better bases for comparison than the overall total in this case. In this regards, the model including non-trade variables adds a more substantive 10% and 8% respectively (for a total sensitivity of 55.5% and total PPV of 77.4%). While both of these numbers are a far cry from the results found in BB's original treatment of the subject (their sensitivity was 85% and PPV was 88.6%), as mentioned before, there are multiple possibilities that would explain this. Certainly, the poorly-trained economist would look the results, see a 30% drop in sensitivity,

and conclude that “excessive” bilateralism had carried the day. It may actually be the case that the push for “competitive liberalization” has increased the number of net welfare-reducing PTAs, but the disparity in the size of N between the two studies, let alone the qualitative differences, prohibits one from making such a corollary without further research on the matter. It could just as easily be the case that simply expanding the data set to include more countries is the culprit for the loss in sensitivity, or in other words, the original selection of countries may not have been representative of the world at large. Limiting the countries in the data set to only those included originally in BB shows a drop that is less severe, which suggests that this may, at least partially, be the case.

Additionally, the fact that Type II errors outnumber Type I errors nearly 3 to 1 in both models would imply that it is more likely the model is under, rather than over, specified. Further expansion of the number of country pairs as well as the inclusion of other non-trade variables are two promising paths for future research. In this light, the creation of a definitive resource detailing the prevailing differences in nations’ protection of labor, environmental, and intellectual property rights would also be extremely useful in subsequent discussions of PTAs and their determinants (among many other types of discussions as well).

6. Conclusion

The main purpose of this study was to both re-examine and extend the econometric work done by Baier and Bergstrand (2004) though introducing non-trade and political economy factors into their gravity model. While the trade model they proposed continues to perform fairly well when applied to new data, tangible improvements were made in the model's predictive power by the addition of the new variables. The new addition with the strongest marginal effect was found to be the size of the agricultural sectors in partner countries; specifically, countries with agricultural sectors greater than 5% of GDP were about 5% less likely to create Preferential Trade Agreements than countries where neither country had agricultural sectors of that size. The absolute degree of democratization as well as the relative difference between nations were also found to be strong influences. This research highlights both the need for more research into PTA formation as well as offers even more empirical support for the notion that agricultural reform is a major stumbling block in the path towards global trade liberalization.

APPENDIX

Table 1: Probit Results for the Probability of a PTA

Specification	1	2	3	4	5	6
Variable						
Constant	-1.381**	-1.972**	-1.494**	3.891**	5.066**	4.393**
Distance	.922**	.915**	.911**	.946**	.998**	.998**
Remote	.069**	.071**	.074**	.075**	.058**	.055**
Comb GDP	.130**	.174**	.152**	.062**	.033*	.043**
GDP Diff	-.131**	-.116**	-.126**	-.097**	-.087**	-.050*
Rail		-3e-6**	-3e-6**	-2.7e-6*	-2.2e-6*	-2.3e-6*
SR-SR			.787**	.742**	.496**	.483**
5% Agri				-.404**	-.475**	-.659**
10% Agri				-.478**	-.343**	-.188*
20% Agri				-.477**	-.420**	-.474**
Dem Index					.079**	-.099**
Dem Index Diff					-.061**	-.047*
CO2 Diff						-.039**
Mil Spending						.038**
Common Lang						.537**
Pseudo R2	.4322	.4343	.4666	.5083	.5252	.5489
Log Likelihood	-1882.3	-1875.4	-1768.2	-1630.1	-1514.546	-1346.7
Number of Obs.	10535	10535	10535	10585	10011	

** denotes P<.001 in a two-tailed test

* denotes P<.05 in a two-tailed test

Table 2: Marginal Effects on Probability of a PTA (Evaluated at the Means)

Specification	1	2	3	4	5	6
Variable						
Distance	.057**	.056**	.048**	.040**	.046**	.044**
Remote	.004**	.004**	.004**	.003**	.003**	.002**
Comb GDP	.010**	.010**	.008**	.003**	.002*	.002**
GDP Diff	-.008**	-.007**	-.007**	-.004**	-.004**	-.002*
Rail		-1.8e-7**	-1.6e-7**	-1.2e-7*	-1.0e-7*	-1.0e-7*
SR-SR+			.038**	.029**	.021**	.020**
5% Agri+				-.025**	-.033**	-.052**
10% Agri+				-.027**	-.019**	-.009*
20% Agri+				-.022**	-.021**	-.023**
Dem Index					.004**	-.004**
Dem Index Diff					-.003**	-.002**
CO2 Diff						-.002**
Mil Spending						.002*
Common Lang+						.038**
Pseudo R2	.4322	.4343	.4666	.5083	.5252	.5489
Number of Obs	10535	10535	10535	10535	10011	9045

** denotes P<.001 in a two-tailed test

* denotes P <.05 in a two-tailed test

+ denotes the discrete change of dummy variable from 0 to 1.

Table 3: Cross-tabulations of PTA vs Service Economy Dummies

PTA vs One-Sided Service Economy

SR	0	1	Total
PTA			
No	508	9075	9583
Yes	20	982	1002
Total	528	10057	10535

PTA vs Two-Sided Service Economy

SR-SR	0	1	Total
PTA			
No	4122	5461	9583
Yes	135	867	1002
Total	4257	6328	10535

Table 4: Goodness-of-Fit Comparison

Trade-only Model (Spec. 1)

	PTA	No PTA	Total
Pr=Yes	422	186	608
Pr=No	503	7934	8437
Total	924	8120	9045

Full Model (Spec. 6)

	PTA	No PTA	Total
Pr=Yes	513	150	663
Pr=No	412	7970	8382
Total	925	8120	9045

Note: The trade-only model was restricted to only those observations with full data for Spec. 6 to allow for direct comparison between specifications.

Sensitivity: 45.62%

Specificity: 97.71%

Pos. Predictive Value: 69.41%

Total Correctly Classified: 92.38%

Sensitivity: 55.46%

Specificity: 98.15%

Pos. Predictive Value: 77.38%

Total Correctly Classified: 93.79%

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