November 2011

On the Trade and Price Effects of Preferential Trade Agreements

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Abstract

In this paper we extend recent work using the Gravity Model to estimate the trade and price effects of Preferential Trading Arrangements (PTAs), by explicitly taking into account the extent of the *preferential* access being provided by the importer. This involves specifying a trade model, deriving appropriate PTA variables, appending them to a gravity-type equation and estimating it. Estimates of the relative price effects of PTAs are derived and a range of PTAs are considered.

WORK IN PROGRESS

JEL Classification Numbers: F13, F14

Key Words: Preferential Trading Arrangements, Gravity, Trade Diversion

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1. Introduction

With the apparent dormancy of the Doha Round, Preferential Trade Agreements (PTAs) now appear to many policy makers to be the major practical route for obtaining increased market access for their nation's exports. Many countries are now involved in numerous agreements[1], expanding the geographical scope of the predominantly regional trading arrangements of the past. The economic analysis of discriminatory trade of this type has always been a challenge, and discussions of the trade effects of PTAs are still often cast in terms of Viner's concepts of trade creation and trade diversion. Trade creation emerges because partners can now compete with domestic producers free of trade barriers. Trade diversion occurs because partners now have preferential access to the domestic market relative to third parties. Both effects generate increased trade between partners: the former at the expense of domestic producers; the latter at the expense of trade with non-members. But trade between members are not the only trade flows affected by a PTA.

Estimating the magnitude of the trade effects of PTAs has typically relied on the gravity equation, with total bilateral trade or total exports as the variable of interest. In the absence of a theory-based alternative, the significance and magnitude of the estimated coefficients on dummies indicating the presence (or absence) of a PTA between two countries have provided the evidence. Here we build upon this pragmatic approach, taking as our starting point the observation that what usually motivates the formation of a PTA is the prospect of *preferential* access for exports. Yet the extent to which the access thus obtained is truly preferential will not be captured by a dummy variable since it will depend on whether competitors also have preferential access to the same market through this or other PTAs. If preferences are available to all exporters, then none have preferential access. In the past when countries were typically members of one PTA at most, this was perhaps a secondary issue. But now with most countries members of multiple agreements, the *extent* of preferential access is likely to be important for the trade effects of PTA membership.[2] This is the issue that we investigate below.

The empirical literature using the gravity equation to analyse the trade creation effects of PTAs goes back to the 1970s. Since then a huge literature has accumulated, producing what appears to be a mixed bag of results on whether PTAs significantly increase trade among members. These

[1] The number of PTAs reported to the WTO was 25 in 1990, 91 in 2000 and 194 in 2007 (Urata and Okabe, 2007).
[2] Our dataset consists of 184 countries. Of these 150 were at some point in more than one PTA. EU countries tend to be in the most PTAs. In addition to their own PTA, they have agreements with other regional blocs such as the European Economic Area, European Free Trade Association, the Overseas Countries and Territories, and the CARIFORUM, as well as a number of bilateral agreements with countries such as Chile, Cote d'Ivoire, Croatia, Egypt, Faroe Islands, Israel, Jordan, Lebanon, Macedonia, Mexico, Montenegro, Morocco, South Africa, Syria, Turkey, Tunisia, and the Palestinian Authority.

outcomes have taken on greater coherence as more attention has been paid to the theory underlying the gravity equation and the econometrics of its estimation. Several issues are involved. First, the importance of including controls for what Anderson and van Wincoop (2003) refer to as 'multilateral resistances' (MR). Because the average trade costs of a country will affect its bilateral trade, failure to control for these induces omitted variables bias. Second, the recognition that PTA membership is endogenous. Allowance should be made for unobserved bilateral heterogeneity that influences trade and extends beyond the factors explicitly included in the empirical analysis. Countries that trade more for these unobserved reasons may be more likely to join a PTA, and the omission of these factors will bias the PTA estimate upwards[3]. Third, the PTA coefficient estimate itself is subject to omitted variable bias if a single PTA dummy is included but the impacts of preferences on bilateral trade flows vary across individual PTAs. Fourth, as noted earlier, by focussing only on a dummy variable based on joint PTA membership, the analysis ignores the general equilibrium effects that PTAs have on all trading countries (Egger et. al. 2010). A main objective of this paper is to continue the process of explicitly bringing these general equilibrium effects into the analysis. Finally, ideally both the intensive margin (changes to the volume of existing trade flows) and the extensive margin (opening of new trade flows or complete closing of existing trade flows) should be encompassed by the empirical analysis.

The remainder of the paper is organised as follows. In Section 2 we use a standard model to derive our new PTA variables, which take account of PTA membership, the degree of preferential access into the importing country's market and the relative price effects of the PTAs currently in force. Section 3 discusses the estimating method and data used, while Section 4 reports some preliminary results. Section 5 concludes.

2. Preferential Access

To illustrate the potential importance of preferential access in explaining trade flows in a gravity equation context, we adapt the familiar general equilibrium model of Anderson and van Wincoop (2003). Consider a world of n+1 countries where each country is specialised in the production of its own good and has a fixed real output. Countries have identical, homothetic CES preferences. Consumers in county j maximise

[3] This is a point emphasised by Baier and Bergstrand (2002, 2004). They find that two countries are more likely to have a PTA the larger and more similar their GDPs, the closer they are to each other but the more remote the pair are from the rest of the world, and the wider (narrower) the difference in their relative factor endowments with respect to each other (rest of world). Baier & Berstrand (2007) suggest using bilateral fixed effects in a panel data setting, which also controls for the time-invariant component of unobservable MR.

$$\left[\sum_{i=0}^{n} \beta_i^{\sigma/[\sigma-1]} c_{ij}^{[\sigma-1]/\sigma}\right]^{\sigma/[\sigma-1]} \qquad \text{s.t.} \sum_i p_{ij}\, c_{ij} = p_j\, \bar{y}_j \tag{1}$$

Where σ is the elasticity of substitution between goods, β_i is a positive demand parameter relating to product i, $\bar{y}_j$ is the real output of country j, p_j is the relative price of the output of country j (the output of country 0 is chosen as the numeraire), c_{ij} is the consumption of and p_{ij} is the price of country i's output in country j. Trade costs imply that prices differ between countries. Let $t_{ij} \geq 1$ be the trade cost factor between country i and j, implying that $p_{ij} = p_i t_{ij}$. From (1), the value of the demand for country i's goods in country j can be derived as

$$X_{ij} = \frac{[\beta_i p_i t_{ij}]^{1-\sigma}}{R_j} p_j \bar{y}_j \tag{2}$$

where $R_j = \sum_{k=0}^{n} [\beta_k p_k t_{kj}]^{1-\sigma}$ is a measure of aggregate consumer prices in country j. In order to convert (2) into a gravity equation, Anderson and van Wincoop then use the market clearing conditions to solve for $[\beta_i p_i]^{1-\sigma}$. The market clearing condition for the output of country i requires that the value of its output equals the value of demand for it – i.e. from (2) that

$$p_i \bar{y}_i = \sum_{k=0}^{n} X_{ik} = [\beta_i p_i]^{1-\sigma} \sum_{k=0}^{n} t_{ik}^{1-\sigma} \frac{p_k}{R_k} \bar{y}_k \tag{3}$$

When the solution for $[\beta_i p_i]^{1-\sigma}$ is substituted in (2) we obtain a gravity equation

$$X_{ij} = \frac{Y_i Y_j}{Y_W} \frac{t_{ij}^{1-\sigma}}{\Pi_i P_j} \tag{4}$$

where Y_i, Y_W are the value of income (and expenditure) in country i and the world respectively, $\Pi_i \equiv \sum_{k=0}^{n} t_{ik}^{1-\sigma} \frac{\theta_k}{P_k}$ and $P_j \equiv \sum_{k=0}^{n} t_{kj}^{1-\sigma} \frac{\theta_k}{\Pi_k}$ are the 'multilateral resistance' (MR) terms, and θ_k is the share of country k in world income. Bilateral trade costs therefore appear directly in the gravity equation but also indirectly through the MR terms. When estimating this equation, the standard practice is to sweep the MR terms into (time varying if appropriate) country fixed effects, and to focus only on the direct trade costs effect (i.e. the $t_{ij}^{1-\sigma}$ term), which is proxied with the usual variables – geographical distance and dummies for common languages and borders, being landlocked, former colonial status etc. Also included are dummy variables for PTA status, if preferential trade is of interest. The coefficients on the PTA dummies are then interpreted as indicating the net trade creating effects of the relevant PTA, though it is recognised

that the presence of PTAs will also affect bilateral trade flows through the trade costs and induced product price changes in the MR terms[4].

Our objective in this section is to examine the implications of PTA membership on trade flows in a little more detail, with the aim of extracting variables that better capture these effects for the empirical analysis. We begin by deriving the effects of an arbitrary set of changes in trade costs on bilateral export flows. Let $\hat{z}$ denote a proportional change (dz/z) for any variable z. Then using (2) and assuming no induced changes in real outputs, we have

$$\hat{X}_{ij} = -[\sigma - 1]\left[\hat{p}_i + \hat{t}_{ij}\right] + \hat{p}_j - \hat{R}_j \quad \text{and} \quad \hat{R}_j = -[\sigma - 1]\sum_{k=0}^{n} m_{kj}\left[\hat{p}_k + \hat{t}_{kj}\right] \qquad (5)$$

This allows us to write

$$\hat{X}_{ij} = -[\sigma - 1]\left\{\left[\hat{p}_i + \hat{t}_{ij}\right] - \sum_{k=0}^{n} m_{kj}\left[\hat{p}_k + \hat{t}_{kj}\right]\right\} + \hat{p}_j \qquad (5A)$$

where $m_{ij} \equiv \frac{X_{ij}}{p_j \bar{y}_j}$ denotes the (import) market share of country i in j, with $m_{ij} \geq 0$ and $\sum_{i=0}^{n} m_{ij} = 1$, where the latter includes home sales of j. The term in brackets on the right of (5A) indicates that the value of exports from i to j falls if the cost of i's product rises in the j market, relative to a market-share weighted average of cost changes for all suppliers, including j itself. The second term indicates that an increase in the relative price of j's output tends to increase the value of imports from i by increasing numeraire income in j. As (5A) reveals, changes in trade costs will affect trade flows through three channels – a *direct effect*, a *relative price effect* and an *expenditure effect* – as laid out in equation (5B).

$$\hat{X}_{ij} = \underbrace{-[\sigma - 1]\left[\hat{t}_{ij} - \sum_{k=0}^{n} m_{kj}\,\hat{t}_{kj}\right]}_{direct\ effect} \underbrace{-[\sigma - 1]\left[\hat{p}_i - \sum_{k=1}^{n} m_{kj}\,\hat{p}_k\right]}_{relative\ price\ effect} \underbrace{+\hat{p}_j}_{\substack{expenditure \\ effect}} \qquad (5B)$$

The latter two effects depend on the induced changes in relative prices. To determine these we totally differentiate the market clearing conditions (3) which gives us

$$\hat{p}_i = [1 - \sigma]\hat{p}_i + \sum_{k=0}^{n} e_{ik}\left[[1 - \sigma]\hat{t}_{ik} + \hat{p}_k - \hat{R}_k\right] \qquad (6)$$

[4] Anderson and Yotov (2011) explicitly use these relationships to measure the terms of trade and global efficiency effects of PTAs, using data on 2 digit manufacturing sectors.

where $e_{ij} \equiv \frac{X_{ij}}{p_i \bar{y}_i}$ denotes the (export) share of country j in the output of country i, with $e_{ij} \geq 0$ and $\sum_j e_{ij} = 1$, where the latter includes home sales of i. Note further that $e_{ij} = \frac{X_{ij}}{p_j \bar{y}_j} \frac{p_j \bar{y}_j}{p_i \bar{y}_i} = m_{ij} \frac{\theta_j}{\theta_i}$. Using (5) to substitute for $\hat{R}_k$ and rearranging leads to

$$\sigma \hat{p}_i - \sum_{k=0}^{n} e_{ik} \left[\hat{p}_k + [\sigma - 1] \sum_{j=1}^{n} m_{jk} \hat{p}_j \right] = -[\sigma - 1] \sum_{k=0}^{n} e_{ik} \left[\hat{t}_{ik} - \sum_{j=0}^{n} m_{jk} \hat{t}_{jk} \right] \qquad (7)$$

The right side of this equation shows how changes in trade costs affect the demand for i's output. Let $\hat{t}_k^m \equiv \sum_{j=0}^{n} m_{jk} \hat{t}_{jk}$ be the (import) market-share weighted average change in trade costs for all goods sold in country k. Then $\hat{t}_{ik} - \hat{t}_k^m$ gives the change in i's trade costs of selling in k relative to this average. If this term is positive (negative), then k's demand for i's product will fall (rise) other things equal, with the magnitude of this change depending on the elasticity of product substitution. Let $\hat{t}_i^e \equiv \sum_{j=0}^{n} e_{ij} \hat{t}_{ij}$ denote the export-share weighted average change in trade costs for country i. Then we can write (7) as

$$\sigma \hat{p}_i - \sum_{k=0}^{n} e_{ik} \left[\hat{p}_k + [\sigma - 1] \sum_{j=1}^{n} m_{jk} \hat{p}_j \right] = -[\sigma - 1][\hat{t}_i^e - \sum_{k=0}^{n} e_{ik} \hat{t}_k^m] \qquad (8)$$

Demand for product i increases if the average change in *its* export trade costs is lower than the average trade cost change in its export markets.

Taking these equations for all the non-numeraire goods, gives us a system of n equations to solve for the n relative output price changes. This system can be written as

$$[D(\sigma) - S]\hat{p} = -D(\sigma - 1)[\hat{t}^e - E\hat{t}^m] \qquad (9)$$

Where $\hat{p}$ is the nx1 vector of proportional changes in relative output prices; $D(\sigma)$ is an nxn diagonal matrix with σ as its diagonal elements; S is a nxn matrix whose ijth term is $e_{ij} + [\sigma - 1] \sum_{k=0}^{n} e_{ik} m_{jk} > 0$; E is an nx(n+1) matrix of export market shares and $\hat{t}^e$ and $\hat{t}^m$ are, respectively, the nx1 and (n+1)x1 vectors of export and import weighted average trade cost changes defined above. Since the off-diagonal elements of $[D(\sigma) - S]$ are all negative and the sum of the coefficients in the ith row is $e_{i0} + [\sigma - 1] \sum_{k=0}^{n} e_{ik} m_{0j} > 0$; then the diagonal elements are all positive and $[D(\sigma) - S]$ has a dominant diagonal. Thus $[D(\sigma) - S]$ is non-singular. In principle we can then solve for the induced changes in relative prices as functions of the changes in trade costs from

$$\hat{p} = -D(\sigma - 1)[D(\sigma) - S]^{-1}[\hat{t}^e - E\hat{t}^m] \qquad (10)$$

and these solutions can be substituted in (5A) to obtain the total effects of trade costs changes on bilateral trade flows.

Our interest is in identifying the effects of PTA membership amongst the trading parties on the value of their bilateral exports. We start from a pre-PTA equilibrium (i.e. where there are no PTAs), and then suppose countries form PTAs with an exogenously chosen subset of their trading partners. Initially we assume PTA membership has a uniform effect on bilateral trade costs and suppose that if country j grants preferential access to exports from a set of trading partners $i \in S_j$, this corresponds to an equi-proportionate reduction in the trade costs for the corresponding exports – i.e. these costs become $(1-\gamma)t_{ij}; 0 < \gamma < 1, i \epsilon S_j$, implying that $\hat{t}_{ij} = -\gamma$. It then follows that $\hat{t}_k^m = -\sum_{j \in S_k} m_{jk}\gamma = -\bar{m}_k\gamma$, where $\bar{m}_k \equiv \sum_{j \in S_k} m_{jk}$ is the pre-PTA market share of its PTA partners in country k, a measure of the extent of preferential access *offered by k*; and $\hat{t}_k^e = -\sum_{j \in S_k} e_{kj}\ \gamma = -\bar{e}_k\gamma$, where $\bar{e}_k \equiv \sum_{j \in S_k} e_{kj}$ is the pre-PTA share of its PTA partners in country k's exports, a measure of the extent of preferential access *offered to k*. Equation (8) then becomes

$$\sigma\hat{p}_i - \sum_{k=0}^{n} e_{ik}\left[\hat{p}_k + [\sigma-1]\sum_{j=1}^{n} m_{jk}\hat{p}_j\right] = [\sigma-1][\bar{e}_i - \sum_{k=0}^{n} e_{ik}\bar{m}_k]\gamma \qquad (11)$$

The impact of PTA formation on the demand for i's output thus depends on the extent of i's preferential access to its trading partners' markets ($\bar{e}_i$) relative to the (export-share weighted) average of preferential access to those markets in general ($\sum_{k=0}^{n} e_{ik}\bar{m}_k$).

Given the pre-PTA market shares and a value of σ, we can use (10) to solve for the relative price changes in the form

$$\hat{p}_i = b_i\gamma; i = 1, \dots, n \qquad (12)$$

Where the numerical values of the b_i will depend on all the parameters in (10) and (11). These solutions can then be substituted in (5B) to get expressions for the proportionate changes in trade flows as a function of γ.

This leads us to the estimating equation for the effects of PTAs on trade flows. Let $\bar{X}_{ij}$ denote the pre-PTA value of exports of i to j. Then we can write

$$X_{ij} = \bar{X}_{ij} + dX_{ij} = \bar{X}_{ij}\left[1 + \hat{X}_{ij}\right]$$

Which, using (5A) and the solutions for the price changes, gives us

$$lnX_{ij} \cong ln\bar{X}_{ij} + \hat{X}_{ij}$$

$$= ln\bar{X}_{ij} + [\sigma - 1]\left[I_{ij} - \bar{m}_j\right]\gamma - \left\{[\sigma - 1]\left[b_i - \sum_{k=0}^{n} m_{kj}\, b_k\right] + b_j\right\}\gamma \quad (13)$$

where $I_{ij} = 1$ if countries i and j are in the same PTA and 0 otherwise – i.e. I_{ij} is a standard PTA dummy variable. The first term is what the value of exports from i to j would be in the absence of PTAs (and will be captured by standard gravity variables below). The other terms capture the effects of PTAs on this trade. The first of these captures the direct effects of the trade cost changes on this trade flow – the effect normally attributed to the PTA dummy alone. If i and j are not members of a PTA ($I_{ij} = 0$) this term reduces to the direct trade diversion effects of the PTAs that the importing partner belongs to ($-[\sigma - 1]\bar{m}_j\gamma$). If i and j are members of the same PTA, then this term becomes $+[\sigma - 1]\left[1 - \bar{m}_j\right]\gamma$. The standard trade expansion effect is weakened to the extent that the importing country grants preferential access through this and other PTAs. Note that $\bar{m}_j$ will vary over time if j varies its membership of PTAs. The remaining term captures the indirect (relative price and expenditure) effects of the PTAs working through changes in output prices. The solutions from (12) can be inserted in (13) to provide a 'comprehensive' variable capturing the full effects of PTAs on bilateral trade flows. The estimated coefficient on this variable then provides an estimate of γ.

3. Method and Data

Since our focus is on market access, we follow the majority of the literature in using the value of exports as our dependent variable. We take a fairly standard specification of the gravity equation and augment it with our PTA related variables, obtaining

$$lnEXP_{ijt} = \alpha_0 + \alpha_1 lnGDP_{it} + \alpha_2 lnGDP_{jt} + \alpha_3 lnPOP_{it} + \alpha_4 lnPOP_{jt} + \alpha_5 lnDIST_{ij} + \alpha_6 LANG_{ij} + \alpha_7 ADJ_{ij} + \alpha_8 LOCK_{ij} + \Gamma Z_t + \delta_{i(t)} + \omega_{j(t)} + \tau_t + \vartheta_{ij} + u_{ijt} \quad (14)$$

where EXP_{ij} is the value of merchandise trade flow imported by country j from exporter i, GDP_i (GDP_j) is the level of nominal gross domestic product of country i (j), POP_i (POP_j) is the population of country i (j), $DIST_{ij}$ is the distance between economic centres of countries i and j, $LANG_{ij}$ is a binary variable equal to one if countries i and j share a common language, ADJ_{ij} is a binary variable equal to one if countries i an j share a common border, $LOCK_{ij}$ is a variable accounting for whether none, one or both countries are landlocked[5], $\delta_{i(t)}$, $\omega_{j(t)}$, and τ_t are exporter, importer and time fixed effects respectively, where the former two may also be time

[5] $LOCK_{ij}$ takes on the value 0, 1 or 2 depending on whether none, one or both countries are landlocked respectively.

dependent[6], and ϑ_{ij} is a bilateral pair dummy. When we include the bilateral pair dummy, the distance and other geographical variables, which are bilateral-pair time-invariant variables have to be excluded from (14). All variables are included in log form, with the exception of the PTA variables and the dummy variables. We include the PTA effects, denoted by vector Z_t in (14) above, both individually and collectively. While the direct effect $\left[I_{ijt} - \overline{m}_{jt}\right]$ can be included straightforwardly, calculating the price effects requires a value for the elasticity of substitution in consumption. We illustrate results for σ = 8, the values 'preferred' by Anderson and van Wincoop. It is then convenient to define all three PTA effects so that their coefficients each provide an estimate of γ. We therefore define the

direct effect $DE_{ijt} = [\sigma - 1]\left[I_{ijt} - \overline{m}_{jt}\right]$;

relative price effect $RE_{ijt} = -[\sigma - 1]\left[b_{it} - \sum_{k=1}^{n} m_{kjt}\, b_{kt}\right]$; and

expenditure effect $EE_{jt} = b_{jt}$.

If we combine the two price effects and then all three effects we have the

combined price effects $CE_{ijt} = RE_{ijt} + EE_{jt}$; and

total PTA effects $TE_{ijt} = DE_{ijt} + CE_{ijt}$

Data on the GDP and population of the importer and exporter are from the World Development Indicators (2008) dataset. Data on distance, common language and adjacency are from CEPII[7]. The landlocked variable is constructed based on information from Wikipedia[8]. The trade data is taken from COMTRADE via WITS, and in our analysis we consider total exports of the reporter country i. The dataset includes up to 183 countries over the period 1976-2006. Finally, data on PTAs is taken from the WTO website[9] (accessed at various dates) and complemented with information from Baier et al (2008) and Wikipedia.[10]

So far we have modelled the case where all PTAs generate the same proportionate reduction in trade costs among their members. In reality this uniformity is unlikely given the flexibility that

[6] As discussed above the inclusion of country-pair fixed effects is used to account for the multilateral resistance terms. In a panel context however we may need to take account of the time varying nature of these terms through the inclusion of importer-time and exporter-time fixed effects (see Baldwin and Taglioni, 2006).
[7] http://www.cepii.fr/anglaisgraph/bdd/distances.htm
[8] http://en.wikipedia.org/wiki/Landlocked
[9] http://rtais.wto.org/UI/PublicAllRTAList.aspx
[10] The reason for considering alternative sources is that the WTO dataset only includes PTAs in force, thus excluding a number of PTAs that are no longer in force, but that would have been in the period of interest – e.g. the PTAs agreed between the EU-15 and Romania, Bulgaria and others in the 1990s, but which are no longer in force now that these countries are members of the EU.

countries have in the depths of their liberalisations while still meeting the WTO obligations under Article XXIV. So in the empirical analysis we also allow that different PTAs might involve different levels of trade cost reduction and introduce individual γs for the major PTAs. The adjustments that consideration of multiple PTAs requires to our modelling specification are straightforward. Suppose that there are H separate PTAs, indexed as $h \in H$ with associated trade cost reduction γ_h. Define index $I_{ijt}^h = 1$ if countries i and j are members of PTA h at time t and = 0 otherwise. Then we can define preferential access measures analogous to those used above – i.e. $\bar{m}_{jt}^h = \sum_{k=0}^n m_{kjt}\, I_{kjt}^h$, which measures the preferential access to j's market given to members of PTA h, and $\bar{e}_{it}^h = \sum_{k=0}^n e_{ikt}\, I_{ikt}^h$, which measures the preferential access that i receives through its membership of PTA h. To determine the changes in relative prices we use a modified version of (11) (ignoring the time dimension):

$$\sigma\hat{p}_i - \sum_{k=0}^n e_{ik}\left[\hat{p}_k + [\sigma-1]\sum_{j=1}^n m_{jk}\,\hat{p}_j\right] = [\sigma-1]\sum_{h=1}^H\left[\bar{e}_i^h - \sum_{k=0}^n e_{ik}\,\bar{m}_k^h\right]\gamma_h \quad (15)$$

The solution to this system gives us expressions for the relative price changes in terms of the PTA cost reductions, i.e. $\hat{p}_i = \sum_{h=1}^H b_i^h\,\gamma_h$.

These in turn can be used to generate the expression for the proportionate change in the value of exports from i to j giving

$$\hat{X}_{ij} = [\sigma-1]\sum_{h=1}^H\left[I_{ij}^h - \bar{m}_j^h\right]\gamma_h - \sum_{h=1}^H\left\{[\sigma-1]\left[b_i^h - \sum_{k=1}^n m_{kj}\, b_k^h\right] - b_j^h\right\}\gamma_h \quad (16)$$

Again, we insert the relevant PTA-specific direct, relative price and expenditure effects in the standard gravity equation.

4. Preliminary Results

In this section we present and discuss some preliminary estimates for the modelling discussed above. We begin by simply including a dummy variable for PTA membership as has been standard in the literature, and provide estimates with and without time, importer, exporter and trading-pair fixed effects. The results are given in Table 1. The coefficients on the gravity variables are as expected, with the only anomaly being the changing sign on population in the importer. The coefficient on the PTA dummy is positive and significant, but declines in magnitude when we take account of unobserved heterogeneity (through bilateral pair dummies). It predicts an increase in bilateral trade of between 25% and 44% for PTA members.

The direct effect derived in Section 2 modifies the PTA dummy by subtracting a term that captures the degree of preferential access offered by the importer (i.e. $I_{ij} - \bar{m}_j$). The results of

replacing the PTA dummy by this modified version are given in Table 2. The outcomes for the gravity variables are not different from Table 1. But the estimated coefficient on the PTA variable is at first negative and significant, becoming insignificant once we take account of unobserved heterogeneity. Taking even partial account of the trade diverting potential of PTAs, leads to a conclusion that PTAs have had no significant effect on bilateral trade.

The following two tables show that estimates based on the different components of the full PTA effect can be quite varied. Table 3 includes the direct, relative price and expenditure effects separately. These variables have been defined so that all are expected to have positive coefficients, and indeed all coefficients should provide an estimate of the proportional trade cost reduction due to PTA membership. Unsurprisingly these expectations are not meet in full. The direct effect and expenditure effects have positive and significant coefficients, although they are quite different in magnitude, but the relative price variable has a negative and significant coefficient. Combining the 'price' effects gives us the outcomes reported in Table 4. Here the estimated coefficients on the direct effects are quite similar to the corresponding equations in Table 3. The estimated coefficient on the combined price effects varies in sign and significance, however.

When we move to our preferred specification, which includes a single variable combining the full effects of PTAs in the gravity equation, we get the results reported in Table 5. As noted in the previous section, the coefficient on this variable provides an estimate of the proportional reduction in trade costs implied by PTA membership on average. In Table 5 these estimates are statistically significant and range from 4.16% to 1.17% in terms of their estimated trade cost reductions. Our variable is constructed so as to capture the full effects of PTA on the multilateral resistance terms, so the inclusion of time varying importer and exporter fixed effects will be capturing any other influences on trade costs. The country-pair fixed effects should take account of unobserved heterogeneity that might promote PTA membership, and their inclusion indicates trade cost reductions and the lower end of the range (a little over 1%).

Some information on the price effects are provided in Tables 7 and 8. The data used for these calculations is for the year 2006 and the variables listed are: b_i the coefficient on γ in the proportional price change equation (12), which captures the change in the relative price of country i's output; $c_i \equiv \sum_{k=0}^{n} m_{ki} b_k$ capturing the proportional change in the cost-of-living in country i; $gc_i \equiv \sum_{k=0}^{n} e_{ik}[b_i - c_k]$ capturing the change in country i's global competitiveness (gc_i measures the change in the price of i's output relative to the change in the cost-of-living in each of its markets, where each market is weighted by its share in i's sales); θ_i which is country i's

share of world income; $\bar{m}_i$ which captures the extent of the preferences offered *by* country i and $\bar{e}_i$ which captures the extent of preferences offered *to* country i. We draw several conclusions from Table 7. First, that the price effect is highly correlated with the cost of living effect, and that all three price effects are reasonably highly correlated (above 0.63). Second, that all the price effects are more highly correlated with the preferences received than with the preferences offered. Third, country size is not highly correlated with any price outcome, and is not significantly correlated with preferences received or granted. Finally, while the preferences received and granted are significantly positively correlated, the correlation of 0.68 is not as high as one might have imagined.

Table 8 reports the variables from Table 7 at the country level. The countries are listed alphabetically, but their rank in terms of highest to lowest relative price changes are given in column two - i.e. the Dominican Republic has the largest relative price increase and Lebanon has the smallest relative price increase (in fact a reduction). If the numbers in column three are multiplied by the relevant estimate of γ, then they will give the estimated relative price changes.

Some very preliminary results for the total effects of PTAs when we separate out the major individual PTAs are presented in Table 6. Here we find considerable variation in the sign and significance of the estimated coefficients on the PTA effects, depending on whether time, importer and exporter or bilateral pair fixed effects are included. We will focus on the last two columns, which include importer/exporter and country pair fixed effects respectively. Only four individual PTAs have positive and significant coefficients in both columns - the European Economic Area (EEA), the European Free Trade Agreement (EFTA), the Latin American Integration Association (LAIA) and 'Other', our residual of non-major PTAs. Five others have positive and significant estimated coefficients in one case and an insignificant coefficient in the other – ANZCERTA, the Andean Pact (AP), the Central American Common Market (CACM), the Caribbean Community (CARICOM), and the Southern Cone Common Market (MERCOSUR). The North America Free Trade Agreement (NAFTA) is not significant in either equation, while the Association of South East Asian Nations (ASEAN), Asian Pacific Economic Cooperation (APEC) and the European Union (EU) are positive and significant in one equation and negative and significant in the other.

5. Conclusions

Our objective in this paper has been to extend the empirical analysis of the effects of PTA membership on bilateral trade flows, by deriving 'better' indicators of the likely impact on trade of PTA membership. In particular, we sought to capture the potential trade diversion effects that

are missed by the standard membership dummy. We began by considering a standard trade model that generates a gravity equation to explain bilateral trade. Taking the view that PTA formation leads to a reduction in bilateral trade costs amongst PTA members, we were able to derive a variable capturing the 'direct' effects of PTA membership that involved subtracting an indicator of the degree of preferential access offered by the importing country to all its trading partners from the standard membership dummy. Thus this variable took a positive value for bilateral trade between PTA members and a negative value for bilateral trade where the importer was a member and the exporter was a non-member.

We also derived two other price-related PTA effects – a relative price effect and an expenditure effect. Applying the model and under the assumptions that a PTA results in an unknown but common proportional reduction in trade costs among members (γ), we could solve for the corresponding multipliers on γ for these effects and thereby include them in the estimating equation. Our preliminary estimates of the relative price effects show them to be much more highly correlated with preferences received than preferences given, consistent with a focus on market access. When all PTA effects were combined and included we estimated that PTA membership resulted in a trade cost reduction between 1% and 4% on average. Of course this average could hide a wide range of outcomes on individual PTAs, and we provided some preliminary evidence that this might indeed be the case.

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Table 1: A single PTA Dummy

VARIABLES	(1) lexports	(2) lexports	(3) lexports	(4) lexports	(5) lexports	(6) lexports
lgdp_exp	1.157***	1.192***	0.379***	0.419***	0.223***	0.237***
	(0.00270)	(0.00270)	(0.0202)	(0.0130)	(0.0363)	(0.0233)
lgdp_imp	0.952***	0.973***	0.809***	0.892***	0.649***	0.707***
	(0.00288)	(0.00287)	(0.0236)	(0.0155)	(0.0443)	(0.0287)
lpop_exp	-0.0749***	-0.105***	-0.850***	-0.273***	-0.860***	-0.224
	(0.00343)	(0.00340)	(0.0745)	(0.0510)	(0.255)	(0.167)
lpop_imp	0.00468	-0.0139***	0.587***	0.768***	0.449*	0.412**
	(0.00354)	(0.00351)	(0.0769)	(0.0540)	(0.263)	(0.182)
ldist	-1.195***	-1.183***	-1.393***		-1.402***	
	(0.00570)	(0.00565)	(0.00678)		(0.00676)	
contig	0.781***	0.754***	0.552***		0.548***	
	(0.0285)	(0.0288)	(0.0293)		(0.0294)	
comlang_off	0.956***	0.959***	0.932***		0.932***	
	(0.0125)	(0.0123)	(0.0135)		(0.0134)	
lock	-0.408***	-0.311***	-0.764		-1.957	
	(0.00913)	(0.00904)	(3922.8)		(5032.7)	
PTA Dummy	0.350***	0.441***	0.421***	0.297***	0.408***	0.245***
	(0.0122)	(0.0122)	(0.0124)	(0.0188)	(0.0126)	(0.0197)
Fixed Effects:						
Time	No	Yes	Yes	Yes	Yes	Yes
Importer / Exporter	No	No	Yes	No	No	No
Country-Pair.	No	No	No	Yes	No	Yes
Importer-Time and Exporter-Time	No	No	No	No	Yes	Yes
Observations	265,054	265,054	265,054	265,054	265,054	265,054
R-squared	0.663	0.672	0.738	0.087	0.745	0.139
F-Test	68470***	23310***	2051***	1002***	632.5***	41.52***

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Modified Direct effect for a Single PTA

VARIABLES	(1) lexports	(2) lexports	(3) lexports	(4) lexports	(5) lexports	(6) lexports
lgdp_exp	1.156***	1.190***	0.386***	0.425***	0.219***	0.235***
	(0.00271)	(0.00270)	(0.0203)	(0.0130)	(0.0364)	(0.0233)
lgdp_imp	0.941***	0.938***	0.819***	0.900***	0.645***	0.704***
	(0.00309)	(0.00307)	(0.0237)	(0.0155)	(0.0445)	(0.0287)
lpop_exp	-0.0668***	-0.0939***	-0.919***	-0.345***	-0.903***	-0.266
	(0.00342)	(0.00338)	(0.0745)	(0.0508)	(0.255)	(0.167)
lpop_imp	0.0223***	0.0306***	0.536***	0.717***	0.392	0.365**
	(0.00371)	(0.00367)	(0.0777)	(0.0545)	(0.264)	(0.182)
ldist	-1.241***	-1.234***	-1.473***		-1.479***	
	(0.00552)	(0.00548)	(0.00639)		(0.00637)	
contig	0.856***	0.859***	0.609***		0.604***	
	(0.0285)	(0.0288)	(0.0295)		(0.0296)	
comlang_off	0.986***	1.004***	0.945***		0.944***	
	(0.0125)	(0.0124)	(0.0136)		(0.0135)	
lock	-0.445***	-0.388***	-0.774		-1.999	
	(0.00928)	(0.00915)	(186.2)		(5470.3)	
$I - \bar{m}$	-0.401***	-1.747***	-0.111	0.0442	0.00762	0.131
	(0.0634)	(0.0647)	(0.106)	(0.0748)	(0.193)	(0.134)
Fixed Effects						
Time	No	Yes	Yes	Yes	Yes	Yes
Importer / Exporter	No	No	Yes	No	No	No
Country-Pair	No	No	No	Yes	No	Yes
Importer-Time & Exporter-Time	No	No	No	No	Yes	Yes
Observations	265,054	265,054	265,054	265,054	265,054	265,054
R-squared	0.662	0.672	0.737	0.086	0.744	0.139
F-Test	67882***	23076***	2039.6***	990.0***	606.9***	41.33***

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Individual Effects for a single PTA: σ = 8)

VARIABLES	(1) lexports	(2) lexports	(3) lexports	(4) lexports	(5) lexports	(6) lexports
lgdp_exp	1.154***	1.188***	0.380***	0.415***	0.228***	0.239***
	(0.00279)	(0.00279)	(0.0203)	(0.0130)	(0.0363)	(0.0233)
lgdp_imp	0.950***	0.971***	0.818***	0.896***	0.647***	0.707***
	(0.00297)	(0.00296)	(0.0236)	(0.0155)	(0.0443)	(0.0287)
lpop_exp	-0.0730***	-0.102***	-0.835***	-0.302***	-0.784***	-0.191
	(0.00348)	(0.00345)	(0.0761)	(0.0517)	(0.256)	(0.167)
lpop_imp	0.00559	-0.0124***	0.586***	0.723***	0.442*	0.413**
	(0.00362)	(0.00358)	(0.0796)	(0.0555)	(0.263)	(0.182)
ldist	-1.182***	-1.178***	-1.393***		-1.401***	
	(0.00585)	(0.00580)	(0.00679)		(0.00676)	
contig	0.794***	0.777***	0.552***		0.548***	
	(0.0285)	(0.0288)	(0.0293)		(0.0294)	
comlang_off	0.975***	0.980***	0.932***		0.932***	
	(0.0126)	(0.0124)	(0.0135)		(0.0134)	
lock	-0.412***	-0.319***	-0.419		1.420	
	(0.00920)	(0.00911)	(127.3)		(203.3)	
DE	0.0496***	0.0550***	0.0603***	0.0448***	0.0585***	0.0360***
	(0.00178)	(0.00177)	(0.00179)	(0.00274)	(0.00181)	(0.00284)
RE	-0.0134***	-0.0128***	-0.00301	0.00763***	-0.0186***	-0.00772***
	(0.00212)	(0.00210)	(0.00273)	(0.00188)	(0.00403)	(0.00273)
EE	0.308***	0.284***	0.0723**	-0.0675***	0.192***	0.106***
	(0.0233)	(0.0231)	(0.0288)	(0.0204)	(0.0440)	(0.0298)
Fixed Effects						
Time	No	Yes	Yes	Yes	Yes	Yes
Importer / Exporter	No	No	Yes	No	No	No
Country-Pair	No	No	No	Yes	No	Yes
Country-Time	No	No	No	No	Yes	Yes
Observations	265,054	265,054	265,054	265,054	265,054	265,054
R-squared	0.663	0.672	0.738	0.087	0.745	0.139
F-Test	55950***	21686***	2011.5***	923.2***	697.6***	41.45***

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. Combined Price Effects for a single PTA: σ = 8)

VARIABLES	(1) lexports	(2) lexports	(3) lexports	(4) lexports	(5) lexports	(6) lexports
lgdp_exp	1.159***	1.193***	0.378***	0.417***	0.225***	0.237***
	(0.00275)	(0.00275)	(0.0203)	(0.0130)	(0.0363)	(0.0233)
lgdp_imp	0.956***	0.977***	0.816***	0.898***	0.646***	0.706***
	(0.00293)	(0.00292)	(0.0236)	(0.0155)	(0.0443)	(0.0287)
lpop_exp	-0.0764***	-0.105***	-0.853***	-0.284***	-0.833***	-0.217
	(0.00345)	(0.00342)	(0.0756)	(0.0515)	(0.256)	(0.167)
lpop_imp	0.000389	-0.0173***	0.551***	0.758***	0.393	0.386**
	(0.00360)	(0.00356)	(0.0781)	(0.0546)	(0.263)	(0.182)
ldist	-1.198***	-1.193***	-1.393***		-1.402***	
	(0.00569)	(0.00563)	(0.00679)		(0.00676)	
contig	0.780***	0.764***	0.552***		0.548***	
	(0.0285)	(0.0288)	(0.0293)		(0.0294)	
comlang_off	0.955***	0.962***	0.932***		0.931***	
	(0.0125)	(0.0123)	(0.0135)		(0.0134)	
lock	-0.399***	-0.307***	-0.750		-1.884	
	(0.00917)	(0.00908)			(578.7)	
DE	0.0485***	0.0540***	0.0603***	0.0446***	0.0585***	0.0360***
	(0.00177)	(0.00177)	(0.00179)	(0.00274)	(0.00181)	(0.00284)
CE	0.00547***	0.00466***	0.00107	0.00341**	-0.00699**	-0.00133
	(0.00155)	(0.00154)	(0.00205)	(0.00143)	(0.00303)	(0.00208)
Fixed Effects						
Time	No	Yes	Yes	Yes	Yes	Yes
Importer /Exporter	No	No	Yes	No	No	No
Country-Pair	No	No	No	Yes	No	Yes
Importer-Time & Exporter-Time	No	No	No	No	Yes	Yes
Observations	265,054	265,054	265,054	265,054	265,054	265,054
R-squared	0.663	0.672	0.738	0.087	0.745	0.139
F-Test	61567***	22440***	2025.6***	961.2***	692.8***	41.48***

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Total Effects for a single PTA: σ= 8

VARIABLES	(1) lexports	(2) lexports	(3) lexports	(4) lexports	(5) lexports	(6) lexports
lgdp_exp	1.164***	1.198***	0.367***	0.418***	0.212***	0.233***
	(0.00273)	(0.00273)	(0.0203)	(0.0130)	(0.0364)	(0.0233)
lgdp_imp	0.946***	0.965***	0.828***	0.902***	0.659***	0.708***
	(0.00290)	(0.00289)	(0.0236)	(0.0155)	(0.0444)	(0.0287)
lpop_exp	-0.0762***	-0.105***	-1.044***	-0.383***	-1.037***	-0.298*
	(0.00345)	(0.00342)	(0.0748)	(0.0509)	(0.255)	(0.167)
lpop_imp	0.0140***	-0.00156	0.730***	0.796***	0.505*	0.410**
	(0.00354)	(0.00350)	(0.0777)	(0.0545)	(0.263)	(0.182)
ldist	-1.220***	-1.218***	-1.428***		-1.424***	
	(0.00557)	(0.00553)	(0.00663)		(0.00666)	
contig	0.818***	0.808***	0.577***		0.565***	
	(0.0285)	(0.0289)	(0.0294)		(0.0294)	
comlang_off	0.972***	0.981***	0.938***		0.935***	
	(0.0125)	(0.0124)	(0.0135)		(0.0134)	
lock	-0.418***	-0.329***	-0.603		1.573	
	(0.00915)	(0.00906)	(125.1)			
TE	0.0240***	0.0259***	0.0342***	0.0123***	0.0416***	0.0117***
	(0.00119)	(0.00118)	(0.00139)	(0.00127)	(0.00156)	(0.00168)
Fixed Effects						
Time	No	Yes	Yes	Yes	Yes	Yes
Importer / Exporter	No	No	Yes	No	No	No
Country-Pair	No	No	No	Yes	No	Yes
Importer-Time & Exporter-Time	No	No	No	No	Yes	Yes
Observations	265,054	265,054	265,054	265,054	265,054	265,054
R-squared	0.662	0.671	0.737	0.087	0.745	0.139
F-Test	68078***	23141***	2046.3***	994.5***	608.42***	41.39***

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Total Effects for Individual PTAs: σ= 8

VARIABLES	(1) lexports	(2) lexports	(3) lexports	(4) lexports
lgdp_exp	1.162***	1.198***	0.370***	0.426***
	(0.00273)	(0.00274)	(0.0202)	(0.0130)
lgdp_imp	0.955***	0.975***	0.816***	0.891***
	(0.00292)	(0.00292)	(0.0235)	(0.0155)
lpop_exp	-0.0616***	-0.0906***	-0.844***	-0.333***
	(0.00347)	(0.00344)	(0.0743)	(0.0509)
lpop_imp	0.0155***	-0.00158	0.529***	0.753***
	(0.00357)	(0.00354)	(0.0768)	(0.0541)
ldist	-1.173***	-1.169***	-1.366***	
	(0.00569)	(0.00564)	(0.00691)	
contig	0.803***	0.805***	0.633***	
	(0.0293)	(0.0296)	(0.0295)	
comlang_off	0.885***	0.897***	0.861***	
	(0.0128)	(0.0126)	(0.0137)	
lock	-0.391***	-0.299***	-0.748	
	(0.00920)	(0.00910)	(3966.9)	
asean	-0.0985***	-0.116***	-0.0356**	0.0295*
	(0.0206)	(0.0210)	(0.0169)	(0.0158)
anzcerta	0.247***	0.245***	0.120***	-0.0555
	(0.0443)	(0.0387)	(0.0209)	(0.320)
ap	0.0572***	0.0568***	0.133***	-0.152
	(0.0156)	(0.0166)	(0.0188)	(0.0960)
apec	0.00620	0.00572	0.0399***	-0.0127***
	(0.00449)	(0.00452)	(0.00502)	(0.00382)
cacm	0.436***	0.421***	0.365***	-0.207
	(0.0142)	(0.0142)	(0.0161)	(0.146)
caricom	0.679***	0.691***	0.659***	-0.0186
	(0.0148)	(0.0145)	(0.0140)	(0.0280)
eea	0.0908***	0.0936***	0.0492***	0.0356**
	(0.0105)	(0.0102)	(0.0106)	(0.0151)
efta	0.170***	0.123***	0.0837***	0.0530*
	(0.0154)	(0.0163)	(0.0185)	(0.0313)
eu	-0.0150***	-0.00235	-0.0999***	0.0676***
	(0.00531)	(0.00538)	(0.00606)	(0.00762)
laia	0.219***	0.190***	0.246***	0.227***
	(0.00848)	(0.00870)	(0.00964)	(0.0574)
mercosur	0.186***	0.184***	-0.0626**	0.00589
	(0.0302)	(0.0303)	(0.0258)	(0.0552)
nafta	0.457***	0.420***	-0.0346	0.000464
	(0.0272)	(0.0264)	(0.0261)	(0.0246)
other	0.0303***	0.0416***	0.0751***	0.0222***
	(0.00310)	(0.00309)	(0.00323)	(0.00312)
Constant	-32.60***	-32.54***	3.364*	-30.96***
	(0.0900)	(0.0925)	(1.835)	(1.259)
Fixed Effects				
Time	No	Yes	Yes	Yes
Importer / Exporter	No	No	Yes	No
Country-Pair	No	No	No	Yes
Importer-Time & Exporter-Time	No	No	No	No
Observations	265,054	265,054	265,054	265,054
R-squared	0.666	0.675	0.740	0.087
F-Test	30309***	16643***	2020.9***	655.6***

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Correlation Matrix for price effects 2006

	Price Change (b_i)	Preferences Offered ($\bar{m}_i$)	Preferences Received ($\bar{e}_i$)	COL Change (c_i)	Income Share (θ_i)
Preferences Offered ($\bar{m}_i$)	0.0219	1			
Preferences Received ($\bar{e}_i$)	0.549	0.6868	1		
COL Change (c_i)	0.9915	0.063	0.5379	1	
Income Share (θ_i)	0.0445	-0.0609	-0.0155	0.0389	1
Competitiveness Change (gc_i)	0.7148	-0.1569	0.4264	0.6393	0.0634

Table 8: Country Price Effects in 2006

Exporter	Rank	Price Change (b_i)	Preferences Offered ($\bar{m}_i$)	Preferences Received ($\bar{e}_i$)	COL Change (c_i)	Income Share (θ_i)	Comp Change (gc_i)
Albania	163	-0.30797	0.1776	0.067469	-0.27124	0.000116	-0.11636
Algeria	16	0.276049	0.096404	0.18443	0.225386	0.001731	0.068282
Angola	129	-0.11575	0	0	-0.08564	0.000288	-0.03543
Antigua and Barbuda	48	0.089105	0.051224	0.005889	0.149328	0.000021	-0.03434
Argentina	64	0.03463	0.033209	0.047466	0.03541	0.008977	-0.00125
Armenia	77	0.004865	0.05859	0.038436	0.029342	6.04E-05	-0.05586
Australia	164	-0.36364	0.045357	0.029407	-0.32415	0.013169	-0.08648
Austria	25	0.217788	0.215882	0.191641	0.228729	0.006039	-0.02403
Azerbaijan	47	0.092019	0.087326	0.068033	0.126599	0.000167	-0.0491
Bahamas, The	70	0.019509	0.003935	0.007673	0.040532	0.000175	-0.01836
Bahrain	157	-0.25504	0.209749	0.074094	-0.19464	0.000252	-0.09278
Bangladesh	123	-0.10596	0.075392	0.008412	-0.05938	0.001488	-0.0569
Belarus	26	0.215661	0.284082	0.233083	0.23613	0.000402	-0.0547
Belgium	17	0.265391	0.324957	0.315231	0.245022	0.00734	0.034938
Belize	95	-0.03126	0.033209	0.009782	-0.00624	2.63E-05	-0.0449
Benin	92	-0.01819	0.059982	0.075731	-0.02666	7.12E-05	-0.00393
Bermuda	58	0.054437	0	0.015346	0.057876	0.000111	-0.00125
Bhutan	96	-0.03849	0	0.043828	-0.06696	1.35E-05	0.019696
Bolivia	100	-0.04645	0.093123	0.060786	-0.03428	0.000265	-0.0209
Botswana	167	-0.41012	0.209281	0.002139	-0.2998	0.000178	-0.06693
Brazil	84	-0.0071	0.025276	0.024234	0.000986	0.020363	-0.01245
Brunei Darussalam	88	-0.01614	0	0.086594	-0.06734	0.00019	0.045785
Bulgaria	42	0.111842	0.166122	0.1752	0.123911	0.000408	-0.04015
Burkina Faso	172	-0.86899	0.06369	0.01757	-0.82478	8.25E-05	-0.04525
Burundi	102	-0.04812	0.022799	0.000111	-0.03563	2.24E-05	-0.02818
Cameroon	103	-0.04871	0.036516	0.009331	-0.01206	0.000318	-0.05114
Canada	22	0.229706	0.170591	0.235375	0.178934	0.022897	0.082432
Cape Verde	83	-0.00675	0.003398	0.000965	-0.00083	1.68E-05	-0.02722
Central African Republic	137	-0.14982	0.010696	3.36E-05	-0.12765	3.03E-05	-0.02213

Chad	91	-0.01783	0	0.003144	-0.01621	4.37E-05	-0.00421
Chile	50	0.080965	0.165228	0.165155	0.068393	0.002376	0.020881
China	133	-0.13508	0.04136	0.079484	-0.09197	0.037854	-0.06249
Colombia	69	0.019993	0.0327	0.030101	0.026027	0.00317	-0.00839
Comoros	108	-0.06636	0.022062	0.000154	-0.04511	6.38E-06	-0.01442
Congo, Dem. Rep	120	-0.09811	0	0	-0.07008	0.000136	-0.02809
Congo, Rep	119	-0.09631	0	0.001969	-0.06456	0.000102	-0.03719
Costa Rica	39	0.127413	0.18097	0.201858	0.110555	0.000504	0.036414
Cote d'Ivoire	59	0.050769	0.055611	0.054559	0.079736	0.000329	-0.03459
Croatia	131	-0.1229	0.199222	0.110268	-0.08049	0.000673	-0.13573
Cuba	162	-0.30405	0.052862	0.004163	-0.28406	0.000965	-0.05936
Cyprus	144	-0.17133	0.184	0.066156	-0.11392	0.000294	-0.11204
Czech Republic	10	0.333746	0.283878	0.298689	0.320254	0.001792	0.038998
Denmark	32	0.168824	0.17711	0.165848	0.179156	0.005056	-0.02111
Djibouti	18	0.265154	0	0.072407	0.204755	1.74E-05	0.059511
Dominica	97	-0.0429	0.099651	0.075501	-0.03272	8.56E-06	-0.03004
Dominican Republic	1	0.910094	0	0.155272	0.779874	0.000758	0.129632
Ecuador	55	0.05973	0.07797	0.076358	0.060438	0.000504	0.003806
Egypt	107	-0.06617	0.063521	0.040142	-0.04436	0.003153	-0.03716
El Salvador	43	0.111828	0.152194	0.168835	0.105546	0.000415	0.020975
Equatorial Guinea	117	-0.08484	0	0.008498	-0.052	3.96E-05	-0.03854
Estonia	6	0.371597	0.205405	0.359034	0.311206	0.000179	0.097274
Ethiopia	89	-0.01633	0.004456	0.0011	-0.01144	0.000258	-0.00682
Fiji	125	-0.10962	0.101337	0.099544	-0.10863	5.32E-05	-0.00201
Finland	15	0.283111	0.140219	0.192417	0.256269	0.003844	0.038712
France	21	0.232231	0.130569	0.135432	0.222626	0.041944	0.017738
Gabon	122	-0.10578	0.004431	0.00025	-0.08235	0.00016	-0.05256
Gambia, The	126	-0.11308	0.044227	0.00565	-0.1072	1.33E-05	-0.06551
Georgia	98	-0.04332	0.060871	0.035851	-0.02469	9.66E-05	-0.07998
Germany	2	0.524562	0.145253	0.158507	0.424046	0.060019	0.164779
Ghana	150	-0.21013	0.101173	0.024875	-0.17076	0.000157	-0.08255
Greece	158	-0.25857	0.127678	0.060635	-0.23004	0.003966	-0.10699
Greenland	62	0.040909	0.195983	0.171258	0.060057	3.37E-05	-0.04851
Grenada	143	-0.1662	0.08426	0.017965	-0.15453	1.36E-05	-0.07385
Guatemala	35	0.150049	0.13042	0.159221	0.13518	0.000609	0.036737
Guinea	65	0.03048	0.050146	0.033407	0.06042	9.83E-05	-0.02736
Guinea-Bissau	140	-0.16092	0	0.003749	-0.16078	6.81E-06	-0.00212
Guyana	105	-0.05001	0.164597	0.072352	0.006985	2.25E-05	-0.07387
Haiti	79	0.003453	0	0.000155	0.005109	0.000116	-0.00226
Honduras	9	0.333813	0.181529	0.310793	0.240035	0.000224	0.154274
Hong Kong	155	-0.24018	0.250169	0.042448	-0.17116	0.005342	-0.14457
Hungary	12	0.3231	0.274866	0.306873	0.302163	0.001513	0.041023
Iceland	46	0.099389	0.155521	0.148648	0.119516	0.000275	-0.03626
India	148	-0.19945	0.020273	0.017924	-0.17509	0.014535	-0.049
Indonesia	111	-0.07161	0.063313	0.07694	-0.06427	0.005212	-0.01163
Iran	106	-0.0569	0.028624	0.060666	-0.0625	0.003199	-0.00137
Ireland	8	0.351546	0.206367	0.301524	0.279741	0.003051	0.109069

Israel	52	0.073042	0.162675	0.165531	0.067476	0.00394	-0.00253
Italy	23	0.220683	0.124039	0.120586	0.209437	0.03466	0.016268
Jamaica	112	-0.07257	0.046534	0.004905	-0.0424	0.000285	-0.05328
Japan	154	-0.23949	0.004647	0.009117	-0.20718	0.147422	-0.05153
Jordan	147	-0.19776	0.184077	0.054461	-0.1657	0.000267	-0.10076
Kazakhstan	31	0.175934	0.120207	0.130888	0.181247	0.000578	-0.01635
Kenya	56	0.059686	0.004038	0.03807	0.05793	0.000401	0.02995
Kiribati	127	-0.11383	0	0.002972	-0.11313	2.16E-06	-0.00158
Korea, Rep.	90	-0.01691	0.057978	0.077813	-0.01729	0.016847	0.006513
Kyrgyz Republic	99	-0.04595	0.173827	0.095654	-0.00738	4.33E-05	-0.12749
Lao PDR	20	0.236232	0	0.090807	0.183013	5.48E-05	0.054457
Latvia	37	0.130876	0.225855	0.205215	0.155111	0.000247	-0.06342
Lebanon	174	-1.27115	0.137373	0.025034	-1.17526	0.000545	-0.09726
Lesotho	173	-0.87809	0.381541	0.001334	-0.62325	2.36E-05	-0.25573
Liberia	57	0.058635	0	0.004296	0.116426	1.77E-05	-0.05142
Libya	44	0.111182	0	0.011148	0.137604	0.001071	-0.02443
Lithuania	33	0.167444	0.184723	0.190722	0.185659	0.000361	-0.05665
Luxembourg	45	0.107596	0.294939	0.224488	0.147599	0.00064	-0.07697
Macao	153	-0.2276	0.114033	0.010983	-0.18398	0.000193	-0.07514
Macedonia, FYR	86	-0.01421	0.259273	0.172553	0.028774	0.000113	-0.09554
Madagascar	71	0.019273	0.013224	0.00714	0.040085	0.000123	0.000887
Malawi	156	-0.24256	0.126976	0.029097	-0.20668	5.51E-05	-0.01705
Malaysia	54	0.065381	0.267928	0.282657	0.017737	0.002962	0.066432
Maldives	134	-0.14173	0.088531	0.000446	-0.11528	1.97E-05	-0.06546
Mali	161	-0.28444	0.094862	0.003482	-0.25949	7.65E-05	-0.0857
Malta	93	-0.02018	0.298556	0.17306	0.034382	0.000123	-0.09548
Marshall Islands	34	0.153987	0	0.00023	0.195875	3.40E-06	-0.02198
Mauritania	73	0.011002	0.014161	0.057663	0.014399	3.41E-05	-0.01496
Mauritius	104	-0.04931	0.055747	0.014616	-0.01202	0.000145	-0.03935
Mexico	36	0.135287	0.221546	0.216982	0.111902	0.018364	0.042496
Micronesia, Fed. Sts.	138	-0.15294	0	0.000242	-0.1416	7.14E-06	-0.01108
Moldova	19	0.251074	0.126453	0.19081	0.254999	4.07E-05	0.012312
Mongolia	124	-0.10694	0	0	-0.08728	3.44E-05	-0.07819
Morocco	81	-0.00184	0.200232	0.161303	0.020894	0.001169	-0.04718
Mozambique	139	-0.15568	0.108015	0.025612	-0.08598	0.000134	-0.04533
Namibia	166	-0.39989	0.233602	0.002965	-0.28913	0.000124	-0.06272
Nepal	170	-0.60693	0.084171	0.041803	-0.57147	0.000174	-0.03607
Netherlands	7	0.360018	0.218662	0.285467	0.317036	0.012163	0.088052
New Zealand	146	-0.19177	0.055125	0.051031	-0.17002	0.001625	-0.04227
Nicaragua	74	0.010974	0.229856	0.16419	0.02119	0.000124	-0.01955
Niger	114	-0.07781	0.051305	0.011803	-0.05503	5.68E-05	-0.03704
Nigeria	51	0.073709	0.018734	0.06381	0.054136	0.001452	0.020362
Norway	4	0.415194	0.119784	0.205693	0.367905	0.005315	0.078562
Oman	149	-0.20536	0.067067	0.007106	-0.1649	0.000628	-0.06349
Pakistan	113	-0.07597	0.028617	0.013711	-0.06479	0.002336	-0.01906
Palau	159	-0.26109	0	0	-0.25433	3.79E-06	-0.01111
Panama	66	0.029937	0.002153	0.010299	0.043288	0.000367	-0.01115

Papua New Guinea	116	-0.08109	0.135846	0.157184	-0.12112	0.000111	0.030101
Paraguay	76	0.005674	0.133817	0.101548	0.022899	0.000223	-0.00889
Peru	109	-0.06712	0.053878	0.026254	-0.04434	0.001683	-0.03369
Philippines	110	-0.06917	0.104793	0.093334	-0.05737	0.002398	-0.01941
Poland	27	0.201065	0.158939	0.128954	0.220867	0.00541	-0.02825
Portugal	87	-0.01465	0.208373	0.150475	0.019215	0.003696	-0.0719
Romania	28	0.188655	0.176483	0.185304	0.194301	0.00117	-0.01208
Russian Federation	3	0.468737	0.037945	0.039644	0.398583	0.008203	0.100528
Rwanda	72	0.013061	0	0.000977	0.017689	5.48E-05	-0.00018
Samoa	30	0.179024	0	0.143182	0.113232	7.76E-06	0.171046
Saudi Arabia	141	-0.16377	0.005866	0.018025	-0.12851	0.005952	-0.05965
Senegal	132	-0.12845	0.054551	0.022773	-0.11882	0.000148	-0.06676
Seychelles	94	-0.02824	0.048184	0.005917	0.01436	1.94E-05	-0.031
Sierra Leone	63	0.036191	0	0.005377	0.06366	2.01E-05	-0.02566
Singapore	67	0.027931	0.44641	0.348711	-0.01047	0.002929	0.046459
Slovak Republic	14	0.298293	0.222206	0.260063	0.295407	0.000907	0.01406
Slovenia	29	0.188064	0.288621	0.263892	0.204441	0.000628	-0.03073
South Africa	171	-0.79913	0.069702	0.113089	-0.63422	0.004197	-0.30123
Spain	49	0.089012	0.150922	0.13104	0.101205	0.018341	-0.02749
Sri Lanka	60	0.050359	0	0.023819	0.055084	0.000516	0.014639
St. Kitts and Nevis	128	-0.11476	0.065021	0.006165	-0.09499	1.03E-05	-0.05647
St. Lucia	115	-0.07961	0.069214	0.0114	-0.04796	2.23E-05	-0.06404
St. Vincent and the Grenadines	118	-0.09054	0.091103	0.039887	-0.06997	1.07E-05	-0.05512
Sudan	142	-0.165	0.052637	0.029329	-0.16499	0.000391	-0.0228
Suriname	68	0.027128	0.07991	0.034113	0.097051	2.82E-05	-0.07353
Swaziland	168	-0.56242	0.401418	0.028927	-0.4234	0.000047	-0.11559
Sweden	24	0.217922	0.184723	0.183907	0.208555	0.00781	0.005422
Switzerland	41	0.119144	0.195801	0.176537	0.129018	0.007894	-0.03495
Syrian Arab Republic	13	0.300941	0.054559	0.135624	0.283995	0.00061	0.066085
Tajikistan	135	-0.14358	0.371288	0.212932	-0.05949	2.72E-05	-0.08346
Tanzania	130	-0.11816	0.04951	0.02281	-0.10796	0.000287	-0.00723
Thailand	101	-0.0472	0.106354	0.114937	-0.04344	0.003876	-0.0014
Togo	75	0.009057	0.041216	0.065404	2.81E-05	0.000042	0.005369
Tonga	169	-0.57149	0.208318	0.007196	-0.53717	5.96E-06	-0.1436
Trinidad and Tobago	85	-0.0081	0.1072	0.08582	0.002407	0.000258	-0.01801
Tunisia	38	0.129297	0.265453	0.228388	0.15185	0.000614	-0.03236
Turkey	82	-0.00577	0.104016	0.065371	0.018588	0.00842	-0.05368
Turkmenistan	11	0.330828	0.15168	0.241824	0.248587	9.17E-05	0.066894
Uganda	136	-0.145	0.044854	0.003366	-0.12784	0.000196	-0.03154
Ukraine	53	0.070535	0.1779	0.104006	0.103909	0.000987	-0.07815
United Arab Emirates	145	-0.17898	0.013318	0.025024	-0.1547	0.00223	-0.06586
United Kingdom	40	0.127163	0.111734	0.101344	0.133444	0.04667	-0.0116
USA	80	0	0.038839	0.031442	0.006931	0.312654	-0.01381
Uruguay	78	0.004116	0.070596	0.058094	0.017854	0.000721	-0.01693
Uzbekistan	5	0.398474	0	0.085216	0.339418	0.000435	0.057508
Vanuatu	160	-0.27707	0.159933	0.008183	-0.20296	8.87E-06	-0.08668

Venezuela RB	61	0.046827	0.029985	0.041714	0.041604	0.0037	0.00528
Vietnam	121	-0.10053	0.176632	0.080535	-0.06234	0.000985	-0.05352
Yemen, Rep.	152	-0.21882	0.060555	0.006355	-0.19329	0.000298	-0.05867
Zambia	165	-0.37146	0.146267	0.020633	-0.31983	0.000102	-0.05227
Zimbabwe	151	-0.21868	0	0.057953	-0.24178	0.000234	0.053382