The impact of North-South and South-South trade agreements on bilateral trade

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Free trade agreements (FTAs) lead to a rise in bilateral trade even if the signatories include developing countries. Furthermore, the percentage increase in bilateral trade is higher for South-South agreements than for North-South agreements. The results are robust across a number of gravity model specifications in which we control for the endogeneity of FTAs (with bilateral fixed effects) and also take account of multilateral resistance in both estimation (with country-time fixed effects) **and** ***comparative statics (analytically). Our analytical model shows that multilateral resistance dampens the impact of FTAs on trade by less in South-South agreements than in North-South agreements, which accentuates the difference implied by our gravity model coefficients, and that this difference gets larger as the number of signatories rises. For example, allowing for lags and multilateral resistance, a four-country North-South agreement raises bilateral trade by 53% while the analogous South-South impact is 107%.***

1. Introduction

Trade liberalization can play an important role in integrating developing countries into the global market. Trade agreements via customs unions or free trade agreements (FTAs) have become the most popular form to achieve it. According to the World Trade Organization,[1] 283 trade agreements were in force on 31 July 2010, but if we add those being proposed and negotiated, there will be 474. Over 90% of them take the form of FTAs and partial scope agreements, while customs unions account for 10%.[2] Although regional agreements continue to predominate, new agreements increasingly engage developed and developing countries from different geographical regions.

In consequence, there exists a lively debate on the relative merits of arrangements involving developing countries. Issues such as whether developing countries are likely to be better served by agreements

[1] http://www.wto.org/english/tratop_e/region_e/region_e.htm#facts

[2] "Trade agreements" in the generic sense include partial scope agreements, FTAs and customs unions (which are FTAs but with a common external tariff). Our data doesn't include partial scope agreements, but we still make use of the generic term. Furthermore, in the empirics and analytics, we also use the term FTA to refer to both FTAs and customs unions.

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among themselves or by agreements with Northern partners are at the centre stage. In particular, research has focused on the impact of trade agreements on countries' trade flows. [3]

Within this context, the gravity equation has been the traditional model to investigate the effects of trade agreements on bilateral trade flows. Earlier results have been mixed and controversial (Abrams, 1980; Frankel et al, 1995), but recent studies find evidence that trade agreements do increase countries' bilateral trade flows significantly (Baier & Bergstrand, 2007).

Even so, it is not clear that this effect applies systematically to developing countries and whether this holds for agreements with developed and other developing countries alike. On the one hand, developing countries can be unnatural trading partners due to similarities in endowments, smaller economic size and higher trade costs (Krugman, 1991; Magee, 2003), which implies limited trade increases from South-South agreements. On the other hand, developing countries may share demand for similar goods and may succeed in securing more attractive trade concessions from other developing countries than from rich countries (UNCTAD, 2007). Further, trade agreements can extend beyond tariffs to a broader range of 'behind-the-border' trade policy reforms (Preeg, 1998), which may be disproportionately needed in less mature markets.

A number of isolated studies of regional agreements, which happen to be between Southern countries, find evidence of an increase in trade within the region (Cernat, 2003; Lee & Shin, 2006). However, there is no systematic global analysis of trade agreements involving developing countries and distinguishing by trading partner. We therefore examine this issue empirically and differentiate between North-North, North-South and South-South trade agreements.

In a panel of bilateral trade flows, our empirical strategy draws on that of Baier & Bergstrand (2007). In particular, relying on the empirically and theoretically motivated assumption that the determinants of trade agreements can be captured by time invariant characteristics of the country pair, we control for endogeneity by means of bilateral fixed effects. Moreover, we control for multilateral resistance because, as Anderson and van Wincoop (2003) showed, it is not just bilateral trade costs, but those costs relative to the rest of the world – 'multilateral resistance' – that are relevant for predicting bilateral trade flows. Failure to take account of them typically leads one to overstate the impact of reductions in bilateral trade costs on bilateral trade flows. This is related to Viner (1950), who showed that trade agreements may raise trade between signatories but can also reduce trade with non-signatories.

We take account of multilateral resistance in estimation by including country-time fixed effects. However, we go further than Baier & Bergstrand (2007) because, as they acknowledge, one also needs to take account for multilateral resistance when interpreting the gravity model coefficients for comparative static purposes. Our paper is one of few studies that do this.[4] In particular, using a variant of the Baier & Bergstrand (2009) Taylor approximation for comparative statistics, we show analytically that MR effects are smaller for agreements involving smaller countries. As a result, there is a higher

[3] Other key issues surrounding the debate include the welfare implications on both member and non-member countries (Global Economic Prospects, 2005) and the impact on the global multilateral trading system (Bhagwati, 2008; Panagariya, 1999).

[4] Others include Adam & Cobham (2008), Anderson & van Wincoop (2003), Behar & Nelson (2009) and Behar, Manners & Nelson (2009).

dampening effect of MR in North-South than in South-South agreements. The dampening effect as well as the differential gets larger as the number of countries involved in the agreement gets larger.

To preview our results, gravity model coefficient estimates indicate that all FTAs, including those involving developing countries, increase bilateral trade. Furthermore, the coefficients are larger for South-South than North-South agreements and applying our analytically derived comparative statics exacerbates this difference. For example, when we also allow for lagged effects of FTAs, the impact of a 4-country NS FTA is 53% while that for a SS FTA is 107%.

Although this paper offers important substantive and methodological contributions, its scope is narrow. While it accounts for third party effects in our bilateral calculation, it doesn't examine which type of agreements are more likely to increase net trade by calculating the extent of trade diversion. Our analysis holds external tariffs constant, but recent literature examines what happens to tariffs with third parties after the signing of an agreement (Estevadeordal et al, 2008). Nor does our paper assess the variety of potential benefits that go beyond traditional trade gains.

The rest of the paper is structured as follows. Section 2 revisits the economic theory and literature of trade agreements and summarizes the main arguments as well as empirical evidence to compare the relative impact of North-South and South-South trade agreements on countries' bilateral trade flows and welfare. Section 3 introduces the gravity model, multilateral resistance (MR) and its comparative static implications. Section 4 provides information on the data and details our estimation approach. Section 5 presents and interprets the results on bilateral trade flows while section 6 concludes.

2. Trade agreements: theory and evidence

Theoretical work, introduced by Wonnacott & Lutz (1989) and later Krugman (1991) and Frankel et al (1996,1996,1998), provides a number of predictions about which countries are most likely to experience a rise in trade after signing an agreement. The standard arguments focus on the 'natural trading partners' hypothesis, which states that the closer are two countries, the lower are their transport costs and consequently the higher is their trade volume. Thus, trade creation from a trade agreement between two countries is higher the lower is the distance between them. This to some extent explains the fact that many trade agreements are regional.

Recent studies have found other characteristics that are likely to give rise to potential trade-creating agreements, broadening the concept of 'natural trading partners'. Apart from the geographical factors, Baier & Bergstrand (2004) find that trade creation between two trading partners is greater the larger and more similar in economic size they are – because they can exploit economies of scale – and the wider the differences in their relative factor endowments – due to Heckscher-Ohlin comparative advantage. A recent study by Egger & Larch (2008) has further tested and supported these findings in a larger sample.

Because low-income countries are endowed with similar relative factors supplies, are economically smaller and have higher transport costs, they have less scope for realizing the gains from trade based on comparative advantage and exploiting scale economies within South-South blocks. By contrast, because North-South agreements integrate economies with different factor proportions and offer developing countries larger market access, they are more likely to produce efficiency gains. This implies that

Southern countries are likely to be better served by North-South agreements than agreements among themselves (Ethier, 1998; Krueger 1999).

However, if we consider the fact that they have more homogeneous preferences, more similar economic sizes and are geographically closer to each other, developing countries therefore become more 'natural trading partners'. There is also evidence that agreements lead to reforms of other trade-related policies. For example, Lawrence (1996) notes that tariff removal often lead regulatory and other domestic policies to be simplified and realigned between countries. If it is true that developing countries have a greater need for trade-related policies reforms in general, it follows that South-South agreements can address a larger number of trade barriers and promote bilateral trade to a greater extent.

Although the main rationale of developing countries seeking a North-South trade agreement is to secure market access, it is often the case that Southern countries gain little access in practice. While in South-South agreements country members typically set up a single value-added rule applicable to all products, North-South agreements impose restrictive rules of origin (ROOs) for particular sectors (e.g. agriculture) that deprive developing countries of the most important source of increased market access (Cieslik & Hagemejer, 2009).

Empirical papers in this literature often use country-level data and capture the impact of trade agreements by introducing a dummy variable in a gravity-model framework. Baier & Bergstrand (2007) analyse the bilateral trade flows of 96 potential trading partners and find that, on average, an FTA approximately doubles two members' bilateral trade after 10 years. Similarly, Carrere (2006) identifies robust trade creation impacts for a large sample of countries.

Studies focusing on specific South-South regional agreements include Mayda and Steinberg (2006), who analyze the static effects of COMESA on Uganda's trade and find a small but positive impact on trade creation. Other papers present stronger results: Cernat (2003) analyzes seven South–South trade agreements (AFTA, Andean Community, CARICOM, COMESA, ECOWAS, MERCOSUR, SADC) and finds significant effects on trade creation among all them. Lee & Shin (2006) also show robust empirical evidence for intra-bloc trade creation for different East Asian agreements.

Studies on North-South agreements include Cieslik & Hagemejer (2009), who study EU-MENA trade deals and find they raise exports from the EU to MENA but not in the opposite direction. Trefler (2004) analyses perhaps the most relevant North-South trade agreement, NAFTA, and finds out that the agreement had a positive and significant impact on Mexico's trade. However, in line with our previous argument, different studies (Anson et al, 2005; Carrere and de Melo, 2004) show that Mexico's access to the US market was very limited in practice because of restrictive ROOs. More generally, Estevadeordal and Suominen (2004) introduce a synthetic measure of the restrictiveness of ROOs into the standard gravity model and corroborate this result by finding that they can significantly undermine trade between partners.

We have discussed potential gains in trade between signatory countries. However, as argued by Viner (1950), the fact that bilateral trade flows increase does not necessarily mean that net trade rises. Trade creation can occur at the expense of trade diversion. That is, because non-members face an external tariff, trade agreements can divert trade from non-members to member-country suppliers. Thus, the impact of trade agreements on countries' trade is unclear and will depend on whether the trade creation with your partners is greater than the trade diversion with the rest of the world. However, a number of

empirical studies show evidence that trade creation, not trade diversion is the norm (Lee & Shin, 2004; Clausing, 2001; Cernat, 2003).

Further, while it has been intimated that a net increase in trade implies welfare gains (Viner, 1950), the validity of this assumption has been criticized by many economists (Cooper & Massell 1965; Panagariya 1999). They argue that benefits from trade agreements go well beyond the traditional static trade gains, so the Vinerian framework is too narrow to judge overall desirability of the arrangements. The rest of this section briefly discusses some of these issues.

For instance, there exist potential welfare gains arising from "trade-productivity" links. The idea is that goods embody technological know-how and thus, when developing countries trade with rich countries, there is a transfer of technology that can raise developing countries' total factor productivity (Grossman & Helpman, 1991). Various studies at the country level (Keller, 1998; Coe & Hoffmaister, 1999) find evidence that trade between north and south countries strongly promotes technology diffusion and productivity. As an example, Schiff and Wang (2003) show that trade between NAFTA partners had a large and positive impact on Mexico's total factor productivity (TFP).

Moreover, North-South agreements are more ambitious in content and coverage than South-South arrangements and involve "deeper" integration. They go beyond tariff restrictions to include harmonization across a broad range of policies, regulations, laws and institutions (i.e. competition policy, investor rights, product standards, public procurement and intellectual property rights). In consequence, North-South agreements are believed to offer more gains to South members associated with improved governance and policy credibility by supporting institutional reform, increased FDI flows and accelerated transfer of technology (Schiff & Winters, 2003).

However, "deeper" integration might not be a welfare-enhancing proposition when trade agreements are between countries with uneven bargaining power (Panagariya, 1999). The main reason is that the agenda is likely to be set by rich countries and developing countries have to adjust their standards, regardless of whether these are appropriate to their conditions. Moreover, they fear that North-South agreements can become an instrument for extracting concessions of all kinds not just in trade but in other "non-trade" matters. Thus, the benefits in North-South agreements are circumscribed by developing countries' weaker bargaining power and the rules will tend to reflect the status quo of high-income countries (e.g. restrictive rules of origin) (Whalley, 2003).

By contrast, South-South agreements are more likely to ensure the same level playing field for its members. They provide a competition framework between countries at similar stages of development that enable them to develop the capacity of competing successfully, starting with the local market and then internationally. Thus, they need to be less concerned about being swamped by high-quality or cheap imports with which it is difficult to compete.

In the end, a great part of the success derives from countries' willingness to liberalize, accompanied by intense mutual dialogue and understanding. This is easy to achieve in South-South agreements, where country members have similar reasons to engage into trade agreements (UNCTAD, 2007). For example, Martin et al (2008) find that trade agreements reduce the probability of war by offering a political forum and by increasing the opportunity cost of conflicts that disrupt trade. In consequence, South-South agreements can further help developing countries strengthen their own development strategies building on the advantages of proximity, economic similarity and convergence of interests.

These issues are all very important for evaluating the potential welfare gains of North-South and South-South agreements. However, we focus on analysing whether there is a bilateral trade increase associated with these agreements as a first step, and leave the other issues for continued research. To do so, we will use the gravity model within the context of recent methodological developments, which have highlighted the importance of accounting for multilateral resistance. This issue is further discussed in the next section.

3. Gravity, multilateral resistance and trade agreements

A trade agreement between Chile and Peru is expected to raise trade between the two countries, but the size of the impact also depends on whether other countries are party to that agreement. Were the agreement bilateral only, a reduction in the Chile-Peru trade barrier would reduce the costs of trading between Chile and Peru and, importantly, reduce the cost relative to trading with everyone else including, say, Uruguay. The reduction in the relative cost of trading would raise Chile-Peru trade. This comes at the expense of internal trade within Peru and within Chile, but also at the expense of trade with the rest of the world, including Uruguay.

If Uruguay is also party to the agreement, the cost of trading between Chile and Peru falls as before but the cost of trading between Chile and Uruguay also falls. Thus, the cost of trade between Chile and Peru has not fallen as much relative to the cost of trade with other countries, so trade between Chile and Peru does not rise by as much. Anderson & van Wincoop's (2003) seminal contribution considered the effects of ignoring the existence of third parties (Uruguay in our example, but potentially the rest of the world) on the calculated impact of the rise in trade between any two particular countries.

A panel data analogue of the Anderson & van Wincoop (2003) gravity model takes the form

$$M_{12t} = \frac{Y_{1t}Y_{2t}}{Y_t}\left(\frac{P_{1t}P_{2t}}{Z_{12t}}\right)^{\sigma-1} \qquad (1)$$

so that, in logs, the gravity equation is

$$m_{12t} = y_{1t} + y_{2t} - (\sigma-1)z_{12t} + (\sigma-1)p_{1t} + (\sigma-1)p_{2t} \quad (2),$$

where *m* is the log of exports from country 2 to country 1. σ is the elasticity of substitution between products drawn from the consumers' utility function. *z>0* is the log of the bilateral trade cost factor and the *p* terms capture the log of the price indices in each country. Bilateral trade costs are customarily represented by a number of variables, for example distance and whether or not countries share a trade agreement. Accordingly, we specify $(\sigma-1)z_{12t} = \gamma d_{12} - \beta_{SN}FSN_{12t} - \beta_{SS}FSS_{12t}$, where *d* is the log of the bilateral distance between countries *1* and *2*, *FSN* is a dummy that equals 1 if country 1 is from the South and country 2 is from the North (or vice versa) and they have a trade agreement and zero otherwise. *FSS* is a dummy for a South-South trade agreement.[5] This leads to an "empirical" gravity model of the form

$$m_{12t} = y_{1t} + y_{2t} - \gamma d_{12} + \beta_{SN}FSN_{12t} + \beta_{SS}FSS_{12t} \qquad (3),$$

[5] In the empirics, we will also have a dummy for North-South agreements.

such that researchers typically interpret the Beta term(s) as the "effect" of signing an FTA (Tinbergen 1962, Frankel et al, 1995). However, this clearly omits the price terms from equation 1. Anderson & van Wincoop (2003) use equation 1 to show that it is not just bilateral trade costs (*z*), but those costs relative to multilateral trade costs, captured by price indices (*p*), that are relevant for predicting bilateral trade flows.

Anderson & van Wincoop (2003) refer to the price indices as multilateral resistance because they work to aggregate trade costs across the two countries' trading partners. In particular, they specify a full system for each multilateral resistance (MR) term as $P_{1t} = \sum_j \left(\frac{Z_{1jt}}{P_{2t}}\right)^{\sigma-1} S_{2t}$ and $P_{2t} = \sum_i \left(\frac{Z_{i2t}}{P_{1t}}\right)^{\sigma-1} S_{1t}$. *S* is a country's share of world GDP such that each country's index of MR is a weighted average of the bilateral resistance it encounters with all other countries. With reference to equation (3), excluding these variables by construction generates omitted variables bias because the *z* terms inside the *p* terms are correlated with the *z* terms included in the regression. As a result, omitting controls for MR can lead to biased coefficient estimates. As noted in Feenstra (2004), appropriate use of dummies can address estimation issues and this has been the approach of choice in many contributions (Eaton & Kortum, 2002; Rose & van Wincoop, 2001; Redding & Venables, 2000). Although this is not sufficient to calculate the correct comparative statics, empirical researchers have not conducted them on the AvW system due to its complexity.

However, Baier & Bergstrand (2009) developed a first order Taylor approximation to the highly non-linear AvW price terms[6] which effectively allows one to substitute for the price terms by constructing weighted averages of all the trade cost variables included in (3). With reference to their equation 21, this means we can write (2) as

$$m_{12t} = y_{1t} + y_{2t} - \gamma\left(d - MR^{dist}\right)_{12t} + \beta_{SN}(FSN - MR^{SN})_{12t} + \beta_{SS}(FSS - MR^{SS})_{12t} \qquad (4),$$

where $MR^{dist}{}_{12t} = \sum_i S_{it} d_{i2} + \sum_j S_{jt} d_{1j} - \sum_i \sum_j S_{jt} S_{it} d_{ij}$,

$MR^{SN}{}_{12t} = \sum_i S_{it} FSN_{i2t} + \sum_j S_{jt} FSN_{1jt} - \sum_i \sum_j S_{jt} S_{it} FSN_{ijt}$,

and $MR^{SS}{}_{12t} = \sum_i S_{it} FSS_{i2t} + \sum_j S_{jt} FSS_{1jt} - \sum_i \sum_j S_{jt} S_{it} FSS_{ijt}$.

Baier & Bergstrand's (2009) emphasis was on estimation, but ours is the relevant comparative static. Differentiating (4) with respect to the relevant FTA but ignoring MR, the derivative is β_{SN} for a NS agreement and β_{SS} for a SS agreement. To account for MR, we differentiate through the summation terms. For example, $\frac{dm_{12t}}{dFSN_{12t}} = \beta_{SN}(1 - S_{1t} - S_{2t} + 2S_{1t}S_{2t})$. The partial effect is dampened by MR, which is what makes the term in brackets have a value of less than unity. The S_1 term is the change in MR for country 2 (the exporter), which has been lowered by importer 1's share in 2's basket. The S_2 term is importer 1's MR, which has been lowered by exporter *2's* share in 1's basket. Both of these reduce the impact of the FTA. The last term is the (tiny) change in world resistance, which makes it more attractive to trade internationally rather than internally. It is clear from these equations that the term in brackets will be further below one if the two countries are very big. Generally, this effect is not very important because *S* is usually small.

[6] They do it for a cross section, but see Adam & Cobham (2008) for a panel data analogue and an alternative but consistent interpretation of the MR terms.

However, Southern countries generally have smaller values of *S*. To capture this conveniently, we drop time subscripts and denote the size of all Southern countries by S^S and that of all Northern countries by S^N, $S^S < S^N$, such that, for any pair of countries 1 and 2:

$$\frac{dm_{12t}}{dFSN_{12t}} = \beta_{SN}(1 - S^S - S^N + 2S^S S^N) \qquad (5a)$$

$$\frac{dm_{12t}}{dFSS_{12t}} = \beta_{SS}(1 - 2S^S + 2(S^S)^2) \qquad (5b)$$

When $\beta_{SN} = \beta_{SS}$, the absolute value of the derivative is bigger in (5b).

As we generalize to agreements with a small number (>2) of countries, MR becomes more important for the actual comparative static but also for the comparison between South-South and North-South agreements.[7] When countries 1 and 2 are part of an agreement involving 4 countries – 2 Northern and 2 Southern – the analogue to (5a) is

$$\frac{\mathrm{dm_{12t}}}{\mathrm{dFSN_{12t}}} = \beta_{\mathrm{SN}}\left(1 - 3\mathrm{S^S} - 3\mathrm{S^N} + 8\mathrm{S^S S^N} + 2\left(\mathrm{S^S}\right)^2 + 2\left(\mathrm{S^N}\right)^2\right), \qquad (6a)$$

where 1 and 2 are a Northern importer and a Southern exporter (or vice versa). When all 4 countries are Southern, the analogue to (5b) is

$$\frac{\mathrm{dm_{12t}}}{\mathrm{dFSS_{12t}}} = \beta_{\mathrm{SS}}\left(1 - 6\mathrm{S^S} + 12\left(\mathrm{S^S}\right)^2\right) \qquad (6b)$$

Thus, with estimates of Beta from a gravity model and data on the GDP shares, we can conduct appropriate comparative statics. Table 1 gives illustrative values for the values of the terms in brackets, which we refer to as the multipliers. Based on 2000 real GDP values, the average share is 1.04%. This is dominated by a handful of large countries. For example, the United States and Japan have a combined GDP share of 45% with a resulting multiplier that is well below unity. While specific agreements with specific multipliers could be analysed, our application will be to generic groupings. For this purpose, the table also has information on the average size of a Northern country and multipliers involving only Northern countries. Our main comparison of interest is between South-South and North-South agreements, where we see the former multiplier does not stray far from unity but the NS multiplier is below 0.9 once four countries are involved.

[7] We can generalize for the change in trade between countries a and b when k countries sign an agreement: $\frac{dm_{abt}}{dFSS_{k\ countries\ at\ t}} = \beta\left(1 - \left(\sum_j^k S_{jt} - S_{at}\right) - \left(\sum_i^k S_{it} - S_{bt}\right) + \left(\sum_i^k S_{it} \sum_j^k S_{jt} - \sum_h^k S_{ht}^2\right)\right)$. β is the applicable coefficient. The bigger is k, the more important is MR. The extreme case is where k=n ie all countries sign a deal except with themselves, which is the multilateral reduction case applied to distance in Behar & Nelson (2009).

	Share of World GDP	Multiplier (2 countries)	Multiplier (4 countries)
Average Pair	1.04%	0.979	0.938
US; Japan	27.8%; 17.6%	0.645	-
NN	3.40%	0.934	0.81
SS	0.25%	0.995	0.985
NS	3.40%; 0.25%	0.964	0.893
Ratio NN:SS	13.34	0.939	0.822

Table 1: Shares and multipliers. Shares of world GDP based on 2000 GDP values in dataset. Multipliers use formula from equations 5 or 6 with share values as arguments.

Why is MR more important when bigger countries are involved? MR is a GDP-weighted average of bilateral trade costs, so big "third countries" have a large weighting in the other countries' baskets. Changes in trade costs with these big countries therefore have a big impact on multilateral resistance. For example, if the third country is Uruguay, which is small, then this has a relatively small effect on Chile's multilateral resistance, which falls by only a little, and hence has a relatively small mitigating effect on the impact of the FTA on Chile-Peru trade. If the country is the United States, this would have a big downward impact on Chile's multilateral resistance, which reduces the extent to which the absolute reduction in Chile-Peru costs (Z_{12}) is a relative reduction (Z_{12}/P_1P_2) and hence has a relatively big mitigating effect on the impact of the FTA on Chile-Peru trade.

Multilateral resistance by definition refers to trade costs that are not confined to the bilateral barriers between two countries. It is thus concerned with "third country" effects. If Chile and Peru sign an agreement but nothing happens with Uruguay, the cost of trading with Uruguay goes up in relative terms, so trade with Uruguay falls. By predicting reduced trade with third parties, accounting for multilateral resistance has many points of contact with the concept of trade diversion. In fact, the algebra offers a precise prediction of what would happen to bilateral trade involving all country pairs. By differentiating equation 4 with respect to the MR terms but keeping the FTA term constant, it can be established that trade with third parties falls.[8] To compute the full extent of trade diversion and hence a net effect on a country's exports, however, would require a calculation for all third countries (e.g. changes in M_{i2} for all i importers) and would make us stray from this paper's objective. Leaving this question to future research, our concern remains with bilateral trade; MR is only relevant for our efforts to calculate the bilateral comparative static effects correctly.

4. Data and estimation

We use the same data as Baier and Bergstrand (2007),[9] which comes from different sources: nominal bilateral trade flows for 96 trading partners and at 5 year intervals from 1960 till 2000 come from the International Monetary Fund's Direction of Trade Statistics; nominal GDPs are from the World Bank's World Development Indicators (2003); bilateral distances, language and adjacency dummy variables

[8] For example, countries 1 and 2 can be Chile and Peru respectively such that the equation is for exports from Peru to Chile. Changes in exports from Uruguay to Chile can be found by assigning Uruguay the subscript 3. In general, $\frac{\mathrm{dm}_{13t}}{\mathrm{dFSS}_{12t}} < 0$.

[9] We thank Scott Baier and Jeff Bergstrand for facilitating our use of the data.

were compiled from the CIA Factbook; and the FTA dummy variable was calculated using appendices in Lawrence (1996) and Frankel (1997) as well as various websites detailed in the Data Appendix. It includes full FTAs and customs unions but not partial agreements. A list of the trade agreements analysed, including a classification of them into North-North, North-South and South-South FTAs is detailed in the Data Appendix together with a table containing the 96 potential trading partners.

Our estimation approach draws on that of Baier & Bergstrand (2007) but instead of having only one dummy for the FTA, we split agreements into those between two Northern countries, between two Southern countries and between a Northern country and a Southern country. The criteria to classify countries by level of income is based on the World Bank Atlas Method, which classifies every world economy as low income, middle income and high income depending on their gross national income. We have used the official WB thresholds for 1987 and divided the countries in our sample between North (with more than 6,000 $ per capita annually), which include high-income countries and South (less than 6,000 $ per capita annually), which include low- and middle-income countries.

The trade agreement dummies we create are effectively an interaction between a general FTA dummy and a dummy for whether the signatories are Southern, Northern or a combination. These dummies capture all kinds of observable and unobservable country characteristics. With reference to the theoretical discussion in Section 2, these include those features that make countries more natural traders and that influence the nature of the trade agreement struck. While our need to distinguish between types of FTAs is in part motivated by the theoretical discussion, this specification is not intended to test any claim directly.

We include time-and-country (*it* & *jt*) as well as bilateral (*ij*) dummies. The time-and-country dummies are primarily included to control for multilateral resistance. An alternative would be to construct MR terms from observables usually included in gravity models (as in Adam & Cobham, 2008), but dummies offer a number of advantages. Construction of MR terms is subject to measurement error, particularly the internal distance measure (Baier & Bergstrand, 2009). In most cases, for example distance, the variation over time is due only to variation in the GDP share terms, which leads to multicolinearity. Furthermore, dummies also capture any other time-varying exporter- and importer-specific effects like GDP and unobserved characteristics. For this reason, we use the time-and-country dummies.[10]

Identification of the FTAs as a causal effect must be mindful of unobserved characteristics that affect both trade and FTAs, some of which were noted in Section 2. Further, Baier & Bergstrand (2007) provide evidence that FTAs are expected to be signed by countries expecting further additional trade facilitation, for example reduced red tape or eased visa processing, because the benefits are greater when the other restrictions are higher. Such unobservables are in the error term and are negatively correlated with trade but positively correlated with FTAs. It follows (Wooldridge, 2002) that failing to control for this source of endogeneity leads to an underestimate of the FTAs coefficients.[11]

[10] Constructing the terms may be an attractive option if the variable of interest is monadic because such country specific variables, for example business environment variables, cannot be identified when using time-and-country dummies (Behar, Manners & Nelson, 2009).

[11] It can appear inconsistent to be using this argument to argue this causes downward bias while at the same time ignoring arguments that closer countries trade more. However, this second cause of (upward) bias is always controlled for with observable variables, like distance, so standard gravity specifications do not experience upward bias from this source.

Furthermore, Baier & Bergstrand (2007) appeal to the literature and empirical evidence to argue that these characteristics are related to potential trade levels, not any fluctuations over time. Unobservables affecting potential trade and FTAs are therefore well captured by bilateral fixed effects.[12] These fixed effects will also capture any other time-invariant country-pair characteristics (e.g. distance, adjacency, common language) that are common in gravity models but not of direct interest. Remaining endogeneity concerns are investigated by running specifications that estimate the effect of future FTAs on current trade flows (Wooldridge, 2002).

A further factor in panel data spanning more than two periods is potential autocorrelation. Wooldridge (2002) suggests first differenced estimators may be preferable to the pair-specific dummies. An alternative is to employ the estimator developed by Baltagi & Wu (1999). This allows one to account for autocorrelation in the error term by specifying a first-order autoregressive process for the error terms, which we do here.[13] A potential rationalization of autocorrelation is lags in the implementation of agreements after signing and in the trade response to the implementation. For this reason, like Baier & Bergstrand (2007), we run specifications with lagged values of the FTAs.

5. Results

This section presents regression output (Table 2) together with comparative statics (Table 3).

	-1	-2	-3	-4	-5	-6	-7
Any FTA	0.458***						
NN		0.471***	0.468***	0.355***	0.178***	0.228***	0.316***
NS		0.320***	0.307***	0.337**	0.183*	0.186*	0.448***
SS		0.528***	0.533***	0.360***	0.371***	0.311***	0.273*
NN(-1)					0.422***	0.194***	0.242***
NS(-1)					0.294**	0.339***	-0.023
SS(-1)					0.367**	0.355**	0.354*
NN(-2)						0.350***	
NS(-2)						-0.13	
SS(-2)						-0.0791	
NN(+1)							-0.0826
NS(+1)							-0.126
SS(+1)							0.094
N	48235	48235	47081	40108	45262	41656	37960
R-sq	0.31	0.31	0.189		0.285	0.263	0.265

Table 2: Gravity regression results. Dependent variable is log of real bilateral trade except in column 3, where trade is divided by the product of importer and exporter GDP. Constant, pair dummies and country-time dummies included but not reported. Standard errors clustered by country pair, except column 4, where Baltagi & Wu (1999) standard errors are used. * 5% ** 1% *** 0.1%.

[12] Random effects methods cannot adequately deal with this source of endogeneity. Furthermore, Egger (2000) records the superiority of bilateral fixed effects methods over a random effects specification.

[13] We prefer the Baltagi & Wu (1999) approach to first differencing because it is computationally more convenient, allows explicit modelling of autocorrelation and is in principle less susceptible to downward bias from measurement error.

The first column of Table 2 reproduces the result from Baier & Bergstrand (2007: table 5, column 1), which shows a significant positive coefficient on the FTA dummy. The remaining columns distinguish between agreements signed between Northern countries (NN), between Southern countries (SS) and between Northern and Southern countries (NS). In column 2, all three dummies are significant. The SS coefficient is the highest, implying the signing of such an agreement would raise bilateral trade by $e^{0.528}$–1=70%. This provides evidence that trade gains from FTAs also apply to those involving Southern countries. This important result will be robust across all of our specifications.

The SS coefficient is slightly larger than the NN coefficient but much larger than the NS coefficient, which implies trade would rise by $e^{0.32}$–1=38%. The results are almost identical when we impose the theoretically motivated restriction of unity on GDP in column 3.

The first 3 rows of Table 3 provide the comparative statics associated with column 2 of Table 2.[14] Row 1 has no MR adjustment. The next two rows adjust each coefficient using Table 1. As we anticipated, the effect of MR on the estimated comparative static is very minor for SS agreements – the coefficient value of 0.528 becomes a value of 0.520. For NS agreements, MR has a moderate dampening effect.

Table 2 column reference:	Sceneario:	SS	NS	Difference	Std Error	p
2	No MR	0.528	0.32	0.209	0.111	0.061
	2 countries	0.526	0.308	0.217	0.109	0.046
	4 countries	0.52	0.286	0.235	0.105	0.025
3	No MR	0.533	0.307	0.226	0.112	0.044
	2 countries	0.531	0.296	0.235	0.11	0.033
	4 countries	0.525	0.274	0.251	0.106	0.018
4	No MR	0.36	0.337	0.023	0.146	0.877
	2 countries	0.358	0.325	0.033	0.143	0.817
	4 countries	0.354	0.301	0.053	0.136	0.696
5	No MR	0.737	0.477	0.261	0.16	0.103
	2 countries	0.734	0.459	0.274	0.157	0.081
	4 countries	0.726	0.426	0.3	0.152	0.049

Table 3: Comparative static effects of FTAs. SS refers to South-South agreements and NS refers to North-South agreements. Difference is the difference between the estimated effects of the agreements while the std error and p values refer to this difference. No MR is taken directly from the applicable coefficient in table 2 and ignores multilateral resistance. 2 countries and 4 countries adjust the coefficients for the impacts of multilateral resistance.

Table 3 also presents the difference between the SS and NS effects together with the standard error of the difference and the p-value. The very first row indicates that the p-value of the difference between NS and SS coefficients is 0.06 in the no MR case, but once you account for multilateral resistance, the difference is statistically significant at the 5% level. In the 4-country case, a SS agreement would raise trade by 68%. This is more than double the effect of a NS agreement, which would raise trade by 33%.

[14] Baier & Bergstrand (2007: footnote 11) only consider the no MR case, refer to this as the "treatment effect" and reserve the term "comparative statics" for cases that do account for MR.

The subsequent 3 rows of Table 3 are based on column 3 of Table 2; they produce slightly larger and more significant differences between the SS and NS agreements.

The next regression we present is the Baltagi & Wu (1999) estimator designed to account for potential autocorrelation in the errors. Column 4 of Table 2 leaves the NS coefficient almost unchanged but reduces the other two.[15] While all three coefficients are still positive and significant, they are now similar in size. The applicable comparison in Table 3 confirms that these are not statistically significantly different even after accounting for MR. This tempers the claim that NS agreements have bigger effects than SS agreements. We report that the LBI test statistic for autocorrelation in an unbalanced panel is close to 2, which suggests that autocorrelation is not a material problem (Baltagi & Wu, ibid), so the standard fixed effects estimates in columns 1 and 2 may be more appropriate (Wooldridge, 2002).

As an alternative, column 5 includes lagged values of the FTAs. All six FTA coefficients are significant, with the lagged terms involving Northern countries being higher than the contemporaneous terms. This suggests agreements with Northern countries take longer to realise trade gains. The last three rows of Table 3 present the long run comparative static effects calculated by summing the contemporaneous and lagged coefficients.

Ignoring MR, we see that the difference between the SS and NS effects is larger than when we had no lags (0.261>0.209 for example). However, this is smaller relative to the overall effect. The standard error of the difference is now greater because we are comparing four coefficients and not just two, so the p-value is 0.10. Once we adjust for MR, however, the difference is amplified such that the implied increase is significantly different at 5% for the 4-country case. Accounting for lags also produces generally higher effects than the static specifications, which is consistent with Baier & Bergstrand (2007). For instance, the 4-country example implies effects of NS and SS agreements of 53% and 107%.

As further checks, Table 2 contains two more regressions. We include a second lag in column 6. While the NN dummy is significant even at the second lag, the others are not and do not materially affect the other coefficients. Further, as a check against reverse causality, column 7 includes a specification with future terms for the FTAs, which are not significant.

There is tentative evidence that the Northern countries would see bigger rises in trade if they signed agreements with other Northern countries rather than with Southern countries. We report that the differences in effects are significant at the 10% level in the no lag specification and at the 5% level in the 2-lag specification, but insignificant in the 1-lag specification.[16] Furthermore, as indicated by the multipliers in Table 1, accounting for MR would reduce the difference, so this finding is not robust.

The empirical results in this section have shown that trade agreements involving developing countries do lead to a rise in trade. We have also seen that SS agreements have a bigger proportional effect on SS trade than NS agreements do on NS trade. While our results are couched in percentage terms, the absolute level of trade still rises by more in NS agreements, because our data show that NS trade volumes are of the order of ten times the size of SS trade volumes.[17] These volumes reflect the size

[15] The finding of generally lower coefficients when addressing autocorrelation is consistent with Baier & Bergstrand (2007), who do so by first differencing. Applying the Baltagi & Wu (1999) estimator to a specification with only one FTA dummy, our coefficient of 0.35 is similar to their first-differenced estimate of 0.31.

[16] More detailed statistics and results are avaiable upon request.

[17] Results are available on request.

superiority of Northern countries (cf Table 1) and perhaps some other features which might make NS countries more natural trading partners. However, the higher proportional change for SS agreements indicates that these agreements are relatively more effective at increasing trade than NS agreements. This is consistent with some arguments in Section 2, including the potential for SS agreements to engender a larger number of trade-related reforms and genuine market access.

6. CONCLUSION

This paper has investigated whether trade agreements raise trade for developing countries and compared the effects of South-South and North-South free trade agreements. We have allowed for two sources of variation.

The first source is established by including different coefficients in a gravity model depending on which countries are party to the FTA (i.e. SS, NS and NN). In all specifications, all forms of agreement are positive and significant. Despite concerns that developing countries may not be natural trading partners, those FTAs involving Southern countries indicate a large effect on bilateral trade. Moreover, in all cases, the coefficient for the SS agreement is greater than for the NS agreement and the difference is significant in all but one specification. Allowing for lags raises the long run estimated effect of the FTAs as well as the difference between SS and NS agreements.

The second source of variation is produced by allowing for multilateral resistance in the calculation of comparative statics. This rare exercise is one of the "topics left for other research" by Baier & Bergstrand (2007:9). Moreover, it is relevant in our application because, as we showed analytically in the paper, MR has a bigger downward effect on comparative statics when countries are bigger. Therefore, MR dampens the comparative static effect of a NS agreement by more than a SS agreement. The net result is that the difference between SS and NS agreements is accentuated and statistically significant at 5% in all specifications bar one.

Taking an example of an agreement between 4 countries and coefficients from our dynamic specification, the effect of a NS FTA is 53% while that for a SS FTA is 107%. These estimates are large but in line with those of Baier & Bergstrand (2007). Therefore, South-South agreements have a bigger proportional effect than North-South agreements. These results are consistent with arguments for why South-South agreements may be more effective for raising proportional trade. These including genuine access and the spur to other 'behind-the-border' trade-related reforms, but the results do not verify any of them directly.

More importantly, we are still well short of concluding which agreements are preferable for developing countries. Preferential trade agreements can promote bilateral trade but can also result in trade diversion from third countries (Viner, 1950). Thus, the overall impact of FTAs on countries' trade will depend on whether trade creation is greater than the trade diverted from the rest of the world. Moreover, this paper has assumed external tariffs are unchanged, but they may be affected by FTAs. In particular, there is evidence that arrangements between developing countries have induced a decline in external tariffs (Bohara et al, 2005; Estevadeordal et al, 2008) but that agreements between Northern countries have not (Karacaovali and Limao 2008).

Finally, while a comparison of trade quantities is informative, the nature of trade generated from different agreements can bring important welfare implications. For example, North-South agreements may offer advantages in the form of technology transfer and other productivity gains whereas South-South agreements can foster deeper political and economic integration.

These issues aside, our results show that trade agreements lead to a significant rise in bilateral trade even if the signatories include developing countries. In consequence, developing countries should continue to pursue these agreements.

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DATA APPENDIX

The following is a list of the 96 countries used in the regressions, depending upon availability of trade flows:

Austria	(North)	Belgium–Luxembourg	(North)	Denmark	(North)
Finland	(North)	France	(North)	Germany	(North)
Greece	(South)	Ireland	(North)	Italy	(North)
Netherlands	(North)	Norway	(North)	Portugal	(South)
Spain	(North)	Sweden	(North)	Switzerland	(North)
United Kingdom	(North)	Canada	(North)	Costa Rica	(South)
Dominican Republic	(South)	El Salvador	(South)	Guatemala	(South)
Haiti	(South)	Honduras	(South)	Jamaica	(South)
Mexico	(South)	Nicaragua	(South)	Panama	(South)
Trinidad and Tobago	(South)	United States	(North)	Argentina	(South)
Bolivia	(South)	Brazil	(South)	Chile	(South)
Colombia	(South)	Ecuador	(South)	Guyana	(South)
Paraguay	(South)	Peru	(South)	Uruguay	(South)
Venezuela	(South)	Australia	(North)	New Zealand	(North)
Bulgaria	(South)	Hungary	(South)	Poland	(South)
Romania	(South)	Egypt	(South)	India	(South)
Japan	(North)	Philippines	(South)	Thailand	(South)
Turkey	(South)	Korea	(South)	Algeria	(South)
Angola	(South)	Ghana	(South)	Kenya	(South)
Morocco	(South)	Mozambique	(South)	Nigeria	(South)
Tunisia	(South)	Uganda	(South)	Zambia	(South)
Zimbabwe	(South)	China (Hong Kong)	(North)	Indonesia	(South)
Iran	(South)	Israel	(North)	Pakistan	(South)
Singapore	(North)	Sri Lanka	(South)	Syrian Arab Republic	(South)
China,P.R.: Mainland	(South)	Albania	(South)	Bangladesh	(South)
Burkina Faso	(South)	Cameroon	(South)	Cyprus	(North)
Côte d'Ivoire	(South)	Ethiopia	(South)	Gabon	(South)
Gambia	(South)	The Guinea-Bissau	(South)	Madagascar	(South)
Malawi	(South)	Malaysia	(South)	Mali	(South)
Mauritania	(South)	Mauritius	(South)	Nigeria	(South)
Saudi Arabia	(North)	Senegal	(South)	Sierra Leone	(South)
Sudan	(South)	Congo, Dem. Rep. of	(South)	Congo, Republic of	(South)

According to countries' classification in the previous list, we can distinguish between NN, NS and SS free trade agreements:

FREE TRADE AGREEMENTS	Classification into NN,NS and SS FTAs
European Union, or EU (1958) Belgium–Luxembourg, France, Italy, Germany, Netherlands, Denmark (1973), Ireland (1973), United Kingdom (1973), Greece (1981), Portugal (1986), Spain (1986), Austria (1995), Finland (1995), Sweden (1995)	**NN**
The Customs Union of West African States (1959): Burkina Faso, Mali, Mauritania, Niger, Senegal	**SS**
European Free Trade Association, or EFTA (1960): Austria (until 1995), Denmark (until 1973), Finland (1986–1995), Norway, Portugal (until 1986), Sweden (until 1995), Switzerland, United Kingdom (until 1973)	**NN**
Latin American Free Trade Agreement/Latin American Integration Agreement, or LAFTA/LAIA (1961–1979,1993–): Argentina, Bolivia, Brazil, Chile, Ecuador, Mexico, Paraguay, Peru, Uruguay, Venezuela (became inoperative during 1980–1990, but reinitiated in 1993)	**SS**
African Common Market (1963): Algeria, Egypt, Ghana, Morocco	**SS**
Central American Common Market (1961–1975, 1993–present): El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica (1965)	**SS**
Economic Customs Union of the Central African States (1966): Cameroon, Congo, Gabon	**SS**
Carribean Community, or CARICOM (1968): Jamaica, Trinidad and Tobago, Guyana (1995)	**SS**
EU–EFTA Agreement/European Economic Area (1973/1994)	**NN**
Australia–New Zealand Closer Economic Relations (1983)	**NN**
US–Israel (1985)	**NN**
US–Canada (1989)	**NN**
EFTA–Israel (1993)	**NN**
Central Europe Free Trade Agreement, or CEFTA (1993): Hungary, Poland, Romania (1997), Bulgaria (1998)	**SS**
EFTA–Bulgaria (1993)	**NS**
EFTA–Hungary (1993)	**NS**
EFTA–Poland (1993)	**NS**
EFTA–Romania (1993)	**NS**
EU–Hungary (1994)	**NS**
EU–Poland (1994)	**NS**
North American Free Trade Agreement, or NAFTA (1994): Canada, Mexico, United States	**NS**
Bolivia–Mexico (1995)	**SS**
Costa Rica–Mexico (1995)	**SS**
EU–Bulgaria (1995)	**NS**
EU–Romania (1995)	**NS**
Group of Three (1995): Columbia, Mexico, Venezuela	**SS**

Mercado Comun del Sur, or Mercosur (1991): Argentina, Brazil, Paraguay, Uruguay (formed in 1991 and a free trade area in 1995)	**SS**
Andean Community (1993): Bolivia, Columbia, Ecuador, Peru, Venezuela, Peru (1997)	**SS**
Mercosur–Chile (1996)	**SS**
Mercosur–Bolivia (1996)	**SS**
Canada–Chile (1997)	**NS**
Canada–Israel (1997)	**NN**
Association of Southeast Asian Nations, or ASEAN (1998): Indonesia, Philippines, Singapore, Thailand (effective on 80% of merchandise trade in 1998)	**NS**
CARICOM–Dominican Republic (1998)	**SS**
Hungary–Turkey (1998)	**SS**
Hungary–Israel (1998)	**NS**
India–Sri Lanka (1998)	**SS**
Israel–Turkey (1998)	**NS**
Mexico–Nicaragua (1998)	**SS**
Romania–Turkey (1998)	**SS**
Poland–Israel (1998)	**NS**
Mexico–Chile (1999)	**SS**
Common Market for Eastern and Southern Africa (2000): Egypt, Kenya, Madagascar, Malawi, Mauritius, Sudan, Zimbabwe, Zambia	**SS**
EU–Israel Agreement (2000)	**NN**
EU–Mexico (2000)	**NS**
Poland–Turkey (2000)	**SS**
Mexico–Guatemala (2000)	**SS**
Mexico–Honduras (2000)	**SS**
Mexico–Israel (2000)	**NS**
Mexico–El Salvador (2000)	**SS**
New Zealand–Singapore (2000)	**NN**

Agreements are listed in chronological order of date of entry into force. Years in parentheses denote date of entry, except where notes otherwise.

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