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An Analysis of Mercosur's Regional Trading Arrangements

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1. INTRODUCTION

IN the mid-1980s, Argentina and Brazil promulgated a series of 24 bilateral protocols representing a new chapter in relations between the two largest players of the Southern Cone. In 1991 at the Treaty of Asunción, these protocols were extended to form Mercosur (Mercado Común del Sur), with the inclusion of Paraguay and Uruguay.[1] Although it was originally envisaged that Mercosur would be a fully functioning customs union by 1995, the pace of transition has faltered, reflected in part by the 'adjustment regime' programme allowing intra-Mercosur trade for a select range of products to continue under tariff conditions, whilst 'exceptions lists' have been drawn up to the common external tariff (CET).

Mercosur is locked into negotiations with neighbouring countries of the Americas under the auspices of the US-led Free Trade Agreement of the Americas (FTAA) initiative and the European Union (EU) in forging a regional trading agreement (RTA),[2] although events within and outside of Mercosur have stalled both sets of regional talks. The currency crises in Argentina and Brazil at the end of the 1990s subsequently engulfed Paraguay and Uruguay, weakened the CET as Mercosur members sought short-term concessions and compromised the stability of the Mercosur pact. Examining its external relations, conflicting positions between (*inter alia*) Mercosur (led by Brazil) and the US/EU have also emerged on issues of enhanced market access for agro-food products, investment, services,

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[1] Mercosur encompasses approximately half the population of Latin America and the Caribbean (World Bank, 2005). In more recent times, Bolivia (1995), Chile (1996), Venezuela and Mexico (2004) have been bestowed association status with Mercosur.
[2] Mercosur is also looking to make further bilateral agreements with partners inside (Community of Andean Nations, Colombia, Ecuador) and outside (Canada, Japan, South Africa) South America.

government procurement and intellectual property. Indeed, these ongoing divisions reflected the failure to reach a compromise at the Fifth WTO Ministerial meeting in Cancún in 2003. In agricultural trade, which is the key to brokering a deal with Mercosur, US and EU trade representatives are reluctant to make significant market access concessions before the extent of the agreed WTO agricultural commitments is finalised. The EU in particular has diverted considerable energy into defending the viability of its recently reformed common agricultural policy (CAP) before the international community.

Political considerations aside, one strand of the endogenous free-trade area (FTA) literature suggests that the formation of an FTA is a probabilistic outcome based on the influence of the economic variables which motivate its trade-creating and trade-diverting effects (Lipsey, 1960). For example, Krugman (1991) hypothesises that the variable of economic geography, measured by the transport cost, plays a key role in determining this probabilistic outcome. Thus, with high intercontinental transport costs, an intracontinental FTA has an unambiguous beneficial effect since intracontinental trade creation greatly exceeds intercontinental trade diversion. Subsequent empirical work by Frankel et al. (1998) generalises this observation into two sub-hypotheses. Firstly, the more distant are two continental trade partners from the rest of the world, the greater is the probability of an FTA due to less potential trade diversion. Secondly, the closer are two trade partners, the greater the probability of an FTA due to greater trade-creation effects. In the context of the two trade choices facing Mercosur, we may surmise, *a priori*, that greater trade-led welfare gains to Mercosur lie within the FTAA agreement.

In this paper, we follow a previous study (Monteagudo and Watanuki, 2003) in assessing Mercosur's potential trade-led welfare benefits from an FTAA, an EU RTA and a simultaneous FTAA and EU RTA deal. As performed in Monteagudo and Watanuki (2003), we also assess the impacts of non-tariff barrier (NTB) protection (or 'trade costs') although in addition to their study: (i) we estimate NTB tariff equivalents econometrically for each sector in our aggregation; (ii) we incorporate NTB estimates for the services sector; and (iii) following Francois et al. (1996) we incorporate a 'static' treatment of capital accumulation in the CGE model framework. Accordingly, a further key objective of the study is to revisit the claim by Monteagudo and Watanuki (2003) that inclusion of NTB trade costs 'doubles' Mercosur's welfare gains.

The structure of the paper is as follows. In Section 2, we review previous empirical trade studies of Mercosur. Section 3 provides a theoretical and empirical framework to our estimation of NTBs and the calculation of their tariff equivalents across specific sectors. In the second half of the paper we employ a multi-region CGE trade model to assess the trade scenarios mentioned above, both with and without NTB eliminations. Thus, Section 4 describes the CGE model, its additional modelling extensions and the data, whilst in Section 5 the scenario design and results are presented. Section 6 concludes.

2. CGE MODELLING AND MERCOSUR TRADE

In the empirical international trade policy literature, the development of globally consistent trade databases and powerful computational facility has led to widespread usage of computable general equilibrium (CGE) modelling in trade analysis. In the context of Mercosur, a trawl of the relevant literature reveals several CGE trading assessments presented under three broad scenarios: (i) An FTAA deal; (ii) Mercosur-EU RTA; and (iii) simultaneous Mercosur-EU and FTAA deals. In the studies solicited in our review, two applications (Giordano, 2002; and Diao et al., 2003) apply standard constant returns to scale, perfectly competitive model assumptions. Other CGE studies of Mercosur (Bchir et al., 2001; and Valladao, 2003) incorporate modelling extensions to examine the additional trade and welfare impacts of new trade theories (i.e. imperfect competition; capital accumulation).

Interestingly, despite variations in model datasets, assumptions pertaining to agent behaviour, policy simulations and macro closure,[3] the results of these studies appear to concur in three important respects. Firstly, that trade creation outweighs trade diversion in both RTAs yielding a welfare gain to Mercosur. Secondly, welfare gains are magnified by additional returns to scale gains in imperfectly competitive sectors and capital accumulation effects resulting in further macro growth (Bchir et al., 2001; and Valladao, 2003). Finally, the welfare gains to Mercosur under scenario (iii) are found to be an additive of scenarios (i) and (ii).[4]

One important issue not covered by any of these studies is the trade and welfare impact of eliminating or harmonising market segmenting policies or non-tariff barrier (NTB) 'trade costs', such as health and safety regulations, competition laws (particularly in services), technical standards (e.g. licensing and certification regimes, environmental standards), quantitative restrictions and 'red tape' procedures (e.g. customs clearance).[5] In the case of North American, South American and European services trade (i.e. financial services, construction, trade services, communication etc.), there is significant evidence (Francois and Hoekman, 1999; Hoekman, 1995; Kume et al., 2001; and Park, 2002) of NTB trade costs, whilst other studies (Lejour et al., 2004; and Philippidis and Carrington, 2005) identify European NTB trade costs across a range of product categories, particularly in agro-food sectors.

In the context of Mercosur, only one CGE study, to the best of our knowledge, broadens the reform agenda to include NTB trade costs. Employing perfectly

[3] The chosen endogenous/exogenous split of variables in the CGE model.

[4] Based on the literature sampled, the growth gains to Mercosur from an FTAA (EU RTA) agreement range between 0.25 to three per cent (one to 4.5 per cent) of real GDP. In the case of simultaneously joining FTAA and Mercosur-EU agreements, these gains may be as high as eight per cent of real GDP.

[5] Indeed, the context of this research is even more pertinent given the focus in previous trade rounds on tariff barrier reductions, whilst such trade costs in many countries have remained unchallenged.

TABLE 1
Real GDP Percentage Gains to Mercosur under RTA Scenarios

	Experiment A Elimination of Tariffs Only			*Experiment B Elimination of Tariffs and Additional Trade Costs*		
	FTAA RTA	*EU RTA*	*Both RTAs*	*FTAA RTA*	*EU RTA*	*Both RTAs*
PC model variant	2.57	2.93	5.34	5.64	5.43	10.72
IC model variant	2.84	3.21	5.87	6.27	6.10	11.97

Note:
PC – Perfect Competition; IC – Imperfect Competition.

Source: Monteagudo and Watanuki (2003).

and imperfectly competitive model variants, Monteagudo and Watanuki (2003) examine the three scenarios outlined above with and without the removal of trade costs. The results for Mercosur are consistent with the three broad findings of other studies[6] whilst the elimination of trade costs *doubles* the growth estimates of the standard tariff removal experiments (see Table 1). Whilst undoubtedly representing an important first step in evaluating the broader opportunity costs of potential RTAs, our study seeks to address two sources of bias in their study. Firstly, Monteagudo and Watanuki (2003) 'borrow' tariff equivalent (TE) estimates from non-Mercosur regions (i.e. EU, USA, Canada and Mexico) for broad sector aggregates (e.g. agriculture) which were subsequently applied uniformly to relevant subset sectors (e.g. crops, livestock). Secondly, no TE estimates are included for the 'utilities' and 'services' sectors, which, given the evidence of the literature discussed previously, appears to be a significant omission. Thus, employing a theoretically consistent gravity specification we estimate TE for *each* sector and region, which are subsequently employed in the CGE model simulations for Mercosur.

3. GRAVITY SPECIFICATION

a. Background and Theoretical Foundation

The gravity method provides a benchmark for trade under frictionless conditions. In its simplest form, trade between a pair of countries is a positive function of economic 'size' and a negative function of distance (i.e. transport cost). Since

[6] Namely, that (a) trade creation effects are greater than trade diversion for Mercosur leading to a welfare gain; (b) IRS magnifies the welfare gain estimates; (c) the welfare gain estimates in scenario (iii) are an additive of scenarios (i) and (ii).

the early work of Tinbergen (1962), various authors (Anderson, 1979; Bergstrand, 1989 and 1990; and Deardorff, 1998) have theoretically grounded the approach employing a homothetic constant elasticity substitution (CES) Armington (1969) structure consistent with the assumption of monopolistic competition.[7] More recently, Anderson and van Wincoop (2003), imposing clearing conditions and symmetry in trade costs, derive a theoretically based log-linear gravity equation:

$$\ln X^{ij} = \alpha + \ln Y^{i} + \ln Y^{j} + (1-\sigma)\ln T^{ij} + (\sigma - 1)\ln \tilde{P}^{i}* + (\sigma - 1)\ln \tilde{P}^{j}*, \quad (1)$$

where $\ln X^{ij}$ is bilateral trade flow between countries i and j; $\ln Y^{i}$ and $\ln Y^{j}$ are GDP in i and j; $\ln T^{ij}$ is an iceberg cost;[8] σ is the constant elasticity of substitution between varieties; $\ln Y^{W}$ is world GDP given as α in equation (1); and $\tilde{P}^{i}*$, $\tilde{P}^{j}*$ are composite price indices which are a function of trade costs. Empirically, the iceberg cost T^{ij} incorporates transportation costs, proxied by distance ($Dist^{ij}$) and other sources of unobservable trade costs (τ^{ij}) such as technical standards, health and safety costs, licensing laws and red-tape procedures:

$$\ln T^{ij} = \rho \ln Dist^{ij} + \ln \tau^{ij}, \quad (2)$$

where ρ is an estimable parameter. In some cases, unobservable or hidden NTB trade costs can be modelled by a dummy variable D^{ij}, such as in the case of an international border (McCallum, 1995; and Anderson and van Wincoop, 2003); a monetary union or a preferential trade agreement (Rose and Stanley, 2005; and Kandogan, 2004). The parameter estimate of the dummy then provides an 'average' TE estimate of the trade cost for each bilateral route.

Alternatively, a more general approach employs a residual-based method (Wall, 1999; Park, 2002; Harrigan and Vanjani, 2003; and Deardorff and Stern, 2004). Discrepancies between actual ($\ln X^{ij}_{A}$) and predicted trade ($\ln X^{ij}_{P}$) are taken to be indicative of trade barriers, as the prediction by the gravity equation is assumed to reflect potential trade under frictionless conditions:

$$\ln X^{ij}_{A} - \ln X^{ij}_{P} = (1-\sigma)\ln \tau^{ij}. \quad (3)$$

Francois and Hoekman (1999) and Park (2002) calculate a TE for each country over all its trade partners. Firstly, for each country j, actual and predicted imports are summed over all trade partners ($M^{j}_{A(P)} = \sum_{i=1}^{C} X^{ij}_{A(P)},\ i \neq j$). Subsequently, the

[7] See Chapter 5 of Feenstra (2004) for a comprehensive review of the theoretical and empirical development of the gravity equation.

[8] The concept of an iceberg cost was developed by Samuelson (1952), who suggested that some fraction of a commodity can be conceived of as 'melting' away as a necessary cost of transportation over a unit of distance. This construct is equally applicable to trade costs, which inhibit the 'effective' flow of goods and services from one region to another.

ratio between actual and predicted trade is normalised relative to a free-trade benchmark ratio (τ^b), chosen as the country j with the largest positive difference between actual and predicted trade. Combining with equation (3) gives:

$$\ln\left(\frac{M_A^j}{M_P^j}\right) - \ln(\tau^b) = -\sigma \ln \tau^j. \tag{4}$$

Solving for the tariff-equivalent (τ^j) of trade barriers imposed by country j:

$$(\tau^j - 1) = \exp\left(\ln\left(\frac{M_A^j}{M_P^j}\right) - \ln(\tau^b)\right)^{-1/\sigma} - 1 = \left(\frac{M_A^j/M_P^j}{\tau^b}\right)^{-1/\sigma} - 1. \tag{5}$$

In this study, we favour the residual-based approach for two reasons. Firstly, unlike the dummy-based method, the residual-based method is more general, as it provides a combined estimate of all potential NTB trade costs rather than only the trade cost component related to the dummy in question. Moreover, the residual approach is flexible in that it allows 'bi-directional' estimation of NTB trade costs on each bilateral route, rather than solely 'average' cost estimates provided in the dummy specification.

b. The Empirical Gravity Equation, Data and Results

The gravity equation has been extended in the empirical literature to improve the treatment of transportation costs, thereby improving the identification of trade costs in equation (2). For example, Bergstrand (1985) and Thoumi (1989) include 'shared borders' and 'landlocked' dummies in their models, whilst Garman et al. (1998) and Martinez-Zarzoso and Nowak-Lehman (2003) incorporate 'infrastructure' in facilitating trade between countries. Other authors include cultural or historical linkages that may favour international trade, such as a common language and/or ex-colonial ties (e.g. Frankel et al., 1995; Rose and van Wincoop, 2001; and Park, 2002), whilst Arnon et al. (1996) and Hallack (2006) examine the Linder effect; that is, the hypothesis that countries with similar per capita incomes trade more prolifically. In light of these developments, the empirical gravity specification is:

$$\begin{aligned} x^{ij} = \alpha + \beta_1 gdp^i + \beta_2 gdp^j + \beta_3 sqinc^{ij} + \beta_4 \mathrm{PR}^i + \beta_5 \mathrm{PR}^j + \beta_6 \mathrm{INFR}^i + \beta_7 \mathrm{INFR}^j \\ + \beta_8 dist^{ij} + \beta_9 \mathrm{CONT}^{ij} + \beta_{10} \mathrm{LANG}^{ij} + \beta_{11} \mathrm{MT}^j + \beta_{12} \mathrm{XS}^i + \varepsilon^{ij}, \end{aligned} \tag{6}$$

where lower-case indicate that the respective variable is expressed in logs; x^{ij} – exports from country i to country j; gdp^i – GDP in country i; $sqinc^{ij}$ – squared difference of log per capita GDPs in countries i and j; PR^i – relative indicator of the price level in country i (see below); INFR^i – country-specific infrastructure indicator; $dist^{ij}$ – distance between countries i and j; $CONT^{ij}$ and $LANG^{ij}$ – dummy variables for common border and language, taking value one when countries i and j share a common border and language, respectively; XS^{i} and MT^{j} – tariffs and subsidies (per cent) imposed by exporter i and importer j respectively.

Bilateral trade, protection and GDP data (US$, 2001) for the regression are taken from version six of the GTAP database for 21 tradable sectors.[9] The number of individual countries used in the estimation is 36, whilst remaining countries are collapsed into six composites (see the Appendix for details), making a total of 1,728 bilateral observations, for each sectoral regression. *A priori*, GDP regression estimates are expected to be positive and close to unity, where on the supply side higher regional income indicates greater economic activity and therefore greater availability of goods for exportation; while, on the demand side, a higher income is positively related with the propensity to import. Given the Linder hypothesis, it is anticipated that the larger the differences in per capita income, the less likely is trade between the partner countries.

To estimate the price indices in (1), Anderson and van Wincoop (2003) use an iterative procedure. Alternatively, other authors have employed standard estimation techniques (e.g. OLS) to proxy price indices using GDP's deflators (Bergstrand, 1985 and 1989; and Baier and Bergstrand, 2001), wholesale price indices (Park, 2002) or country-specific effects (Matyas, 1997; and Egger and Pfaffermayr, 2003) with panel data. To avoid some of the difficulties of price indices, such as comparison across countries when base periods differ (Feenstra, 2004) or the inclusion of *non-tradable* items (Anderson and van Wincoop, 2003, p. 16), a relative price-level indicator is constructed in this paper. Thus, employing IMF (2005) data, we collect US dollar equivalent purchasing power parities (PPP) for 2001 in each country. Subsequently, 2001 exchange rates or foreign currency units per dollar are collected, where the ratio of the PPP to the exchange rate provides an index of the level of prices in each country with respect to the US.

The infrastructure indicators are calculated as total road and rail per capita for each country in the sample employing World Bank (2005) and CIA Factbook data. It is expected, *a priori*, that an efficient infrastructure network (lower transport costs) will impact favourably on trade (Bougheas et al., 1999). The distance data are great-circle distances between capital cities where, for composite regions, an arbitrary capital city was selected (see the Appendix). As a direct proxy for transport cost, a negative parameter in the regression is expected. Contiguity and common languages dummies were assigned for each of the sample countries and

[9] The sectors are: crops, vegetables and fruit, livestock, other agriculture, raw materials, meat products, vegetable oils and fats, dairy, sugar processing, other food processing, beverages and tobacco, textiles, wearing apparel, wood, paper and publishing, chemical products, metal products, motor vehicles, light manufacturing, other manufacturing, services. Later in the CGE model, we incorporate imperfect competition into manufacturing sectors. Due to a lack of secondary data on individual service sector concentration indices, we aggregate services together and assume perfect competition.

consistent with other studies, are expected to positively affect trade. Finally, OLS is applied in the estimation, and White's consistent covariance matrix estimator is used to avoid the possible bias of OLS standard errors due to heteroscedasticity.

Results of the gravity equation estimation are shown in Table 2. The adjusted R^2 ranges between 0.60 in the 'other agricultural products' sector and 0.92 in 'services', with all but two sectors higher than 0.70. Therefore, the gravity equation more than adequately explains bilateral trade across a wide range of individual industries. Multicollinearity amongst explanatory variables is not a serious problem (the condition number is under 100).

The effect of incomes of exporter and importer countries is positive, significant at one per cent, with parameter estimates close to unity. The Linder effect is significant in 15 of the 22 sectors at five per cent, although the squared difference in per capita income is positive, implying that trade increases with greater differences in per capita income. This result is related to two factors. Firstly, in the gravity regional aggregation we have not separated any 'outliers' amongst the poorer regions of the world, where, for example, Africa and Asia are aggregated within the Rest of the World (ROW). Thus, the variability in per capita incomes within the sample is reduced.[10] Secondly, differences in per capita incomes are positively correlated with differences in unskilled labour endowments. Thus, Heckscher-Ohlin theory posits that wealthier members will import more unskilled labour-intensive products (e.g. food, textiles, light manufacturing), whilst relatively poorer members will import more capital- and skilled labour-intensive products (e.g. motor vehicles, services).

The effect of the relative price indicators is mixed across sectors in the sample. The exporter's price is significant in all but four of the sectors and a negative effect predominates (14 sectors); the importer's price, on the other hand, is significant in 12 sectors, while positive and negative effects are balanced. As expected, infrastructure indicators are positive and significant in most sectors for both the exporter and the importer (17 sectors). Distance has a highly significant (one per cent) and negative impact on trade in all sectors.[11] Interestingly, distance coefficients are close to unity with the exception of non-tangible services trade, where the negative impact of distance is minimal. The contiguity of the countries favours trade significantly, where this effect is particularly strong in the agro-food-related sectors. Apart from trade in services sectors, countries which share a common language trade more, whilst coefficients are significant in 18 sectors.

Finally, bilateral routes which impose non-zero import tariffs and export subsidies significantly affect trade. Surprisingly, the tariff coefficient is positive, suggesting

[10] Indeed, in a similar gravity aggregation including North Africa, Morocco and Middle East members as separate regions, we find that in a number of sectors (i.e. livestock, other agricultural products, vegetable oils and fats, dairy, sugar, other food products, beverages and tobacco and raw materials), the Linder effect is present and significant at five per cent.

[11] This supports the findings of the endogenous FTA literature noted in the introduction.

TABLE 2
Gravity Equation Estimates

		gdpi	*gdpj*	*sqincij*	*Pri*	*Prj*	*Infri*	*Infrj*	*distij*	*Contij*	*Langij*	*Mtj*	*Xsi*	$\bar{R}^2$	*CN*
Crops	Coeff.	**1.508**	**1.024**	**0.146**	**–3.340**	–0.116	0.046	**0.295**	**–1.107**	**1.109**	**0.683**	**0.062**	**0.062**	0.74	76.06
	p-value	0.000	0.000	0.000	0.000	0.580	0.272	0.000	0.000	0.000	0.000	0.000	0.000		
Veg., fruits and nuts	Coeff.	**1.223**	**0.861**	0.022	**–2.391**	**0.513**	0.025	**0.391**	**–0.708**	**1.439**	**0.412**	**0.065**	**–0.131**	0.68	76.47
	p-value	0.000	0.000	0.325	0.000	0.016	0.571	0.000	0.000	0.000	0.016	0.000	0.109		
Livestock	Coeff.	**0.952**	**1.076**	0.011	**–1.417**	–0.034	**0.362**	**0.191**	**–0.920**	**1.601**	**0.390**	**0.064**	**0.641**	0.77	76.29
	p-value	0.000	0.000	0.537	0.000	0.847	0.000	0.000	0.000	0.000	0.003	0.000	0.009		
Other agric. products	Coeff.	**0.941**	**1.053**	–0.020	**–0.532**	**0.800**	0.070	**0.242**	**–0.713**	**1.215**	**0.759**			0.60	72.75
	p-value	0.000	0.000	0.410	0.069	0.000	0.341	0.000	0.000	0.000	0.000				
Meat	Coeff.	**0.973**	**0.880**	**0.034**	**–0.398**	0.130	**0.312**	**0.073**	**–0.764**	**1.565**	**0.403**	**0.043**	**–0.011**	0.75	76.34
	p-value	0.000	0.000	0.036	0.024	0.432	0.000	0.050	0.000	0.000	0.009	0.000	0.001		
Vegetable oils and fats	Coeff.	**1.116**	**0.910**	**0.036**	**–1.639**	–0.214	**0.243**	**0.072**	**–0.973**	**1.307**	0.203	**0.084**	0.270	0.72	77.56
	p-value	0.000	0.000	0.040	0.000	0.230	0.000	0.059	0.000	0.000	0.255	0.000	0.723		
Dairy	Coeff.	**0.910**	**0.886**	**0.041**	**0.345**	0.203	**0.463**	**–0.085**	**–0.768**	**1.816**	**0.432**	**0.030**	**–0.016**	0.74	77.18
	p-value	0.000	0.000	0.043	0.050	0.287	0.000	0.052	0.000	0.000	0.008	0.000	0.002		
Sugar	Coeff.	**1.052**	**0.941**	**0.122**	**–1.668**	0.037	**0.279**	0.022	**–0.932**	**1.465**	**0.668**	**0.038**	–0.005	0.70	79.06
	p-value	0.000	0.000	0.000	0.000	0.851	0.000	0.604	0.000	0.000	0.000	0.000	0.147		
Other food products	Coeff.	**1.106**	**0.920**	**0.046**	**–1.245**	–0.193	–0.054	**0.228**	**–0.965**	**1.279**	**1.194**	**0.032**	**0.058**	0.75	76.22
	p-value	0.000	0.000	0.015	0.000	0.293	0.281	0.000	0.000	0.000	0.000	0.000	0.052		
Beverages and tobacco	Coeff.	**0.938**	**0.799**	–0.006	–0.054	**0.694**	**0.187**	**0.153**	**–0.683**	**1.148**	**1.350**	**0.017**	**0.539**	0.74	75.69
	p-value	0.000	0.000	0.732	0.792	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
Raw materials	Coeff.	**1.289**	**1.100**	**0.094**	**–2.201**	**–0.841**	**0.171**	**0.417**	**–1.125**	**0.997**	**0.895**	**0.076**	**–0.157**	0.74	75.40
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000		
Textiles	Coeff.	**1.126**	**0.965**	**0.068**	**–1.144**	**–0.555**	**0.277**	**0.098**	**–1.438**	0.289	**0.425**	**0.019**	0.008	0.81	79.79
	p-value	0.000	0.000	0.000	0.000	0.001	0.000	0.015	0.000	0.107	0.001	0.019	0.351		

Wearing apparel	Coeff.	**1.074**	**0.928**	0.003	**–2.061**	**0.402**	**0.152**	**0.084**	**–1.240**	**0.336**	**0.315**	0.005	–0.012	0.80	79.27
	p-value	0.000	0.000	0.830	0.000	0.015	0.000	0.027	0.000	0.054	0.014	0.452	0.271		
Word products	Coeff.	**0.998**	**0.991**	**0.061**	**–0.754**	**0.463**	**0.400**	**0.153**	**–1.359**	**0.590**	**0.533**	**0.038**	0.094	0.74	77.30
	p-value	0.000	0.000	0.003	0.000	0.022	0.000	0.001	0.000	0.005	0.001	0.001	0.474		
Paper and publishing	Coeff.	**1.075**	**0.948**	0.022	**0.676**	**–0.507**	**0.202**	**0.086**	**–1.225**	**0.899**	**0.756**	**0.034**	**0.403**	0.82	75.71
	p-value	0.000	0.000	0.162	0.000	0.001	0.000	0.032	0.000	0.000	0.000	0.003	0.000		
Chemical products	Coeff.	**1.083**	**0.996**	**0.035**	0.228	**–1.210**	**0.280**	0.055	**–1.180**	**0.538**	**0.873**	0.007	–0.051	0.84	76.29
	p-value	0.000	0.000	0.019	0.122	0.000	0.000	0.223	0.000	0.000	0.000	0.586	0.114		
Metal products	Coeff.	**1.189**	**1.066**	**0.143**	**–1.077**	**–0.373**	**0.349**	0.025	**–1.483**	**0.556**	**0.677**	**0.041**	**–0.802**	0.82	77.34
	p-value	0.000	0.000	0.000	0.000	0.032	0.000	0.627	0.000	0.001	0.000	0.001	0.000		
Motor vehicles	Coeff.	**1.270**	**0.988**	**0.048**	0.091	0.155	**0.224**	0.051	**–1.332**	**0.521**	0.076	**0.056**	0.015	0.78	76.61
	p-value	0.000	0.000	0.013	0.616	0.437	0.000	0.323	0.000	0.006	0.601	0.000	0.903		
Light manufact.	Coeff.	**1.147**	**1.000**	**0.097**	**0.661**	**–0.471**	**0.383**	**0.157**	**–1.338**	0.256	**0.727**	**0.067**	**–0.088**	0.83	75.05
	p-value	0.000	0.000	0.000	0.000	0.008	0.000	0.001	0.000	0.139	0.000	0.000	0.001		
Other manufact.	Coeff.	**1.087**	**1.001**	**0.075**	0.216	–0.006	**0.223**	**0.099**	**–1.085**	**0.436**	**0.747**	**0.031**	**0.098**	0.82	77.45
	p-value	0.000	0.000	0.000	0.127	0.973	0.000	0.010	0.000	0.006	0.000	0.000	0.039		
Services	Coeff.	**0.763**	**0.853**	**0.026**	**0.592**	**0.459**	**0.245**	**0.173**	**–0.166**	0.044	–0.090			0.92	72.33
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.699	0.128				

Note:
Coefficients highlighted in bold indicates significance at 10 per cent or less.

that greater tariff barriers are consistent with higher bilateral trade flows. Given the cross-sectional nature of the data, this is a spurious relationship, where many regions impose the largest trade distortion on those commodities for which they have a comparative disadvantage and, consequently, import considerably (e.g. developed country tariffs on agricultural products, textiles). The subsidy results are also slightly ambiguous, although once again we suggest that this is a spurious outcome. More specifically, the EU employs substantial export subsidy support, whilst in some cases due to comparative disadvantage, it does not export much of the product in question.[12]

c. Calculation of Tariff Equivalents

Trade cost tariff equivalents (TEs) are calculated following equation (6) based on differences between actual and predicted trade and sectoral elasticity of substitution estimates from Dimaranan and McDougall (2006). We calculate bi-directional TEs on imports by sector between *specific* pairs of partner countries, namely Mercosur and the EU regions (EU15 and EU10) and Mercosur and the Rest of the American Continent (RoAC). Moreover, to simulate the enlargement of the single market in the baseline, we also estimate bi-directional TE costs between the EU15 and the EU10. The free-trade benchmark is selected as explained above, while $M^{j}_{A(P)}$ is only summed over all countries within the regions of interest. Thus, in the case of Mercosur's imports from the EU15, j refers to the summed imports of all member countries in Mercosur (from each of the countries of the EU15). The extrapolated TEs for each sector from the underlying sectoral regressions are provided in Table 3.[13] Examining the results from the regression suggest that TEs in agriculture and food sectors are relatively high compared with non-food sectors. This observation concurs with other gravity-based TE studies of Colombian-NAFTA trade (Bussolo and Roland-Holst, 1998), European enlargement (Lejour et al., 2004) and borrowed trade cost TE estimates in Monteagudo and Watanuki (2003). However, in comparison with Monteagudo and Watanuki (2003), the *absolute* value of our econometrically estimated NTB equivalents are higher, particularly in the non-food sectors.

4. CGE MODEL AND DATA AGGREGATION

This study employs the Global Trade Analysis Project (GTAP) CGE model (Hertel, 1997) and accompanying version six database (Dimaranan and McDougall, 2006). Version six data represent a significant advance on version five in terms of (*inter alia*) broader regional coverage (87 regions), improved trade and

[12] The EU accounts for over 90 per cent of the world's export subsidies.
[13] Negative TE estimates which are replaced by zero in Table 3 for being economically counter-intuitive.

TABLE 3
NTB Trade Cost Tariff Equivalents (Per cent)

Importer *Exporter*	*Merc.* *EU15*	*Merc.* *EU10*	*Merc.* *RoAC*	*EU15* *Merc.*	*EU10* *Merc.*	*RoAC* *Merc.*	*EU15* *EU10*	*EU10* *EU15*
Crops	28.9	70.3	47.8	1.9	23.6	52.6	60.1	90.4
Vegetables, fruits and nuts	78.0	178.4	100.1	89.3	110.1	136.9	132.9	64.8
Livestock	113.2	179.0	140.7	86.9	104.0	139.6	183.7	173.9
Other agric. products	57.3	115.4	45.8	41.4	64.2	74.7	95.8	63.7
Meat	37.1	39.8	59.7	6.7	16.0	11.1	36.0	39.1
Vegetable oils and fats	16.7	47.6	47.0	6.5	4.6	10.0	92.0	35.0
Dairy	44.5	50.2	90.3	74.4	30.9	18.8	56.4	65.3
Sugar	43.0	54.5	94.2	79.5	84.8	11.7	103.4	71.9
Other food products	63.1	88.4	93.8	2.9	9.1	62.3	100.2	85.4
Beverages and tobacco	160.0	189.2	378.5	221.3	492.9	180.8	263.5	329.5
Raw materials	25.3	23.8	19.4	14.2	14.7	30.0	30.1	34.3
Textiles	26.3	46.1	57.8	29.9	39.4	28.8	28.0	22.6
Wearing apparel	29.9	41.2	65.2	27.7	28.5	26.0	30.6	27.3
Wood products	30.9	52.5	67.1	3.4	22.0	9.6	22.3	37.0
Paper and publishing	17.0	37.8	33.0	0.0	0.0	0.0	19.5	30.3
Chemical products	13.3	17.7	30.2	12.8	22.4	15.1	25.7	26.9
Metal products	19.4	9.2	54.2	12.4	5.2	23.1	30.9	27.9
Motor vehicles	27.8	25.3	58.1	18.9	15.6	14.6	24.7	50.1
Light manufacturing	12.6	7.8	27.6	10.3	8.9	7.7	8.6	19.7
Other manufacturing	25.0	32.0	53.1	15.8	29.7	27.1	26.0	31.1
Services	23.7	21.2	39.2	38.3	43.0	72.8	29.5	31.7

demand elasticity estimates and significant refinements to the support and protection data. To examine the long-run effects of the Mercosur-EU agreement, the regional disaggregation includes the EU15 and EU10 to allow characterisation of EU enlargement, a Mercosur composite region and the RoAC composite to implement the Free Trade of the Americas (FTAA) agreement. The Rest of the World (ROW) region captures residual trade flows in the model. Finally, the same 21 tradable sectors used in the gravity approach are used. In the standard GTAP framework, conventional neoclassical behaviour (utility maximisation, cost minimisation) is assumed, whilst regional utility is aggregated over private demands (non-homothetic), public demands and savings (investment demand). Production is characterised employing a perfectly competitive, constant-returns-to-scale technology, and bilateral imports are differentiated by region of origin using the Armington (1969) specification. The model incorporates five factors of production, where skilled/unskilled labour and capital are perfectly mobile, whilst land and natural resources are both sector-specific with the former moving 'sluggishly' between productive sectors. In all factors markets, full employment is assumed (long run). Finally, investment behaviour is characterised by a fictitious 'global bank' which collects investment funds (savings) from each region and disburses them across regions according to a rate of return *or* a fixed investment share mechanism.

a. CGE Model Extensions

In the model experiments, a perfectly competitive model (described above) and imperfectly competitive variant are employed. In the imperfectly competitive model, we follow an eclectic market structure approach employed in the CGE literature (Brown, 1987; and Hertel, 1994) which combines freedom of entry/exit with oligopolistic strategic (Cournot) conjecture. This gives rise to 'pro-competitive' effects, defined as reductions in the mark-up distortion, as well as changes in the scale of firm output. Furthermore, an array of concentration ratio data sources are employed to calibrate oligopolistic firm numbers to the benchmark dataset,[14] where it is assumed that firms are free to enter and exit these industries over the long run. The 15 manufacturing sectors (including six food processing) are characterised as oligopolistic with increasing returns to scale. All remaining sectors are assumed perfectly competitive.

There is evidence in the trade literature (de Melo and Robinson, 1992; Romer, 1994; and Grossman and Helpman, 1995) linking domestic productivity growth with 'technology transfer'. Greater access (i.e. cheaper prices) to technologically intensive intermediate inputs through imports from developed countries stimulates productivity improvements in the recipient country. This is pertinent to Mercosur and indeed the Latin American sub-continent where trade is one of the key policy variables to sustain long-term economic growth. To capture this effect, we follow Robinson et al. (2002), by assuming (i) technology transfer from imported intermediate inputs of chemical products, electronics and other machinery (light manufacturing) and services, and (ii) that technology transfer only accrues on flows of trade from developed to developing regions.[15]

A third extension relates to the treatment of investment and savings, where in the standard comparative static GTAP framework, no mechanism exists to link

[14] See the Appendix.

[15] The endogenous total factor productivity (TFP) specification follows Robinson et al. (2002) as:

$$\mathrm{TFP}_{j,r} = 1 + \mathrm{IMSHR}_{j,r} \times \left[\frac{\mathrm{INT}_{j,r}}{\mathrm{INT}_{j,r} + \mathrm{VA}_{j,r}} \times \left[\frac{\sum_t \sum_s \mathrm{X}_{t,s,r}}{\sum_t \sum_s \mathrm{X}^0_{t,s,r}} \right]^{\sigma_{j,r}} + \frac{\mathrm{VA}_{j,r}}{\mathrm{INT}_{j,r} + \mathrm{VA}_{j,r}} - 1 \right],$$

where: TFP is total factor productivity growth which appears in the cost function of the industry; IMSHR is the share of the intermediate input of the technologically endowed product to industry j in total intermediate imports into sector j in r; INT is intermediate input usage by sector j in r; VA is primary factor usage by sector j in r; X and X^0 are import and base import flows respectively of the technologically endowed product (t); σ is the sectoral response elasticity of TFP to changes in imports of technologically intensive goods. Thus, *ceteris paribus*, a value of 0.1 would mean that a ten per cent increase in imports of technologically intensive goods would result in a one per cent increase in TFP in that sector. In the absence of any justified estimate in Robinson et al. (2002), we take a cautious approach and assume a value of 0.05 for the elasticity parameter (also see footnote 26).

savings-induced investment with capital endowment accumulation as theorised in Baldwin's (1992) classical growth model. Indeed, a perceived advantage of an RTA is that it promotes long-term economic stability through additional investment. In this study, we employ a modification from Francois et al. (1996), which characterises a long-run 'steady state' equilibrium point defined as the rate of capital growth just sufficient to replace depreciated capital (i.e. zero net investment growth). In the static model treatment, this is accomplished by including a ratio between changes in net investment with the endowment stock of capital services, and a simple closure swap between the ratio (exogenous) and the capital endowment (endogenous).

A further modification to the standard model addresses the potential losses to national exchequers from tariff eliminations under RTAs, as well as further potential revenue losses from third-country trade diversion. We address this issue employing a 'tax neutrality' assumption whereby lost tariff revenues are compensated by uniform regional increases in consumption taxes ensuring that tax revenues remain a constant share of regional income.

Finally, to incorporate the elimination of NTB trade costs, we follow the approach employed in Hertel et al. (2001). Thus, the 'effective' import price (PMS^E) of good k from exporting region i to importing region j is a function of the observed import price (PMS^O) divided by an exogenous technical coefficient (AMS), which captures changes in bilateral trade efficiency such as the removal of trade costs:

$$PMS^E_{k,i,j} = PMS^O_{k,i,j}/AMS_{k,i,j}. \tag{7}$$

An increase in AMS captures reductions in trade costs by reducing the effective price of good k in importing region j from a given exporter i. Since efficiency enhancement reduces trade costs, in true 'iceberg cost' fashion, it also increases the effective quantity of export goods from region i. Thus, in the GTAP model, the effective quantity of exports is the product of observed exports and the technical coefficient:

$$QXS^E_{k,i,j} = QXS^O_{k,i,j} \times AMS_{k,i,j}. \tag{8}$$

Note, that since the effective and observed *values* are identical in the benchmark data, there are no changes in producer revenues and therefore recalibration of the benchmark database is not necessary.

5. SCENARIO DESIGN AND RESULTS

The calculation of long-run trade and welfare effects is based on a stylised 'baseline' scenario (see Figure 1). In the first instance we incorporate the enlargement of the EU from 15 to 25 members, by eliminating all intra-EU import tariffs, export subsidies *and* estimated trade costs from our gravity specification between the EU15 and EU10 regions, whilst the CET is extended to the new EU10 members. In addition, we also represent further decoupling of CAP payments (single farm payment) to give greater credibility to the Mercosur-EU RTA estimates. Following Jensen and Frandsen (2004) we strip out all domestic support wedges and reinsert them as *uniform* hectare premiums on agricultural land in the EU15.[16] In the case of the EU10, we impose the same uniform headage premiums as calculated for the EU15. Finally, we include policy shocks to output subsidies (Amber Box), export subsidies and import tariffs to capture both the Uruguay Round (UR) and a stylised Millennium Round (MR) outcome.[17] Finally, the 'alternative' scenarios are presented in Figure 1 for both perfectly and imperfectly competitive model variants. Scenarios one (S1), two (S2) and three (S3) incorporate the FTAA, the Mercosur-EU RTA and a combination of both agreements respectively. Corresponding scenarios including the removal of trade costs provide scenarios four (S4), five (S5) and six (S6).

a. Protection and Trade

Table 4 shows the tariff structure on bilateral trade between Mercosur and the EU15 and RoAC.[18] Mercosur's import protection (columns one and two) is relatively evenly applied to both regions, although in general the EU faces marginally higher tariff barriers. As expected, EU import protection (column three) is skewed toward agriculture and food due to the protectionist policies of the Common Agricultural Policy (CAP), where sizeable tariff peaks appear for sugar, meat and dairy processing and to a lesser extent in 'sensitive' products such as vegetables, fruits and nuts. For the RoAC (column four), import tariffs peak in food processing and textile sector trade. Note that services sector imports across all regions are free of 'formal' tariff barriers.

Examining Mercosur's trade patterns with both regions (Dimaranan and McDougall, 2006) Mercosur's imports (US$21.6bn – RoAC; US$16.1bn – EU) are skewed toward technologically embodied sectors including chemical

[16] Since the benchmark year for the data is 2001, it is assumed to be representative of the reference period (2000–2002) for calculating SFP entitlements. We also calculate and insert additional payments on livestock and dairy within the SFP.
[17] Tariff reductions under the MR are assumed to be 30 per cent, whilst Amber Box support is reduced by the proposed 60 per cent (40 per cent) over five (ten) years for developed (developing) countries. All export subsidy expenditure is eliminated.
[18] With the exception of motor vehicles (16.7 per cent), sugar processing (9.2 per cent) and light manufacturing (4.7 per cent) sectors, intra-Mercosur trade barriers are at, or close to, zero.

FIGURE 1
Scenario Design and Implementation

Baseline:
Elimination of all tariffs and subsidies between the EU15 and EU10
Formation of common external tariff (CET) on a product basis for the EU10
Introduction of Single Farm Payment scheme on EU agriculture
Uruguay Round and Millenium Round import tariff and export subsidy shocks
Elimination of all trade cost estimates between EU15 and EU10

↓

Scenario 1 (S1 – The Free Trade of the Americas Agreement) *Baseline plus*:
Elimination of all tariff barriers in the Americas

↓

Scenario 2 (S2 – The Mercosur-EU agreement) *Baseline plus*:
Elimination of all tariff barriers between EU15/EU10 and Mercosur

↓

Scenario 3 (S3 – Mercosur-EU agreement and The Free Trade of the Americas Agreement) *Baseline plus*:
Elimination of all tariff barriers between EU15/EU10 and Mercosur
Elimination of all tariff barriers in the Americas

↓

Scenario 4 (S4 – The Free Trade of the Americas Agreement with trade cost elimination) *Baseline plus*:
Elimination of all tariff barriers in the Americas
Elimination of all trade cost estimates between Mercosur and the RoAC.

↓

Scenario 5 (S5 – The Mercosur-EU agreement with trade cost elimination) *Baseline plus*:
Elimination of all tariff barriers between EU15/EU10 and Mercosur
Elimination of all trade cost estimates between EU15/EU10 and Mercosur

↓

Scenario 6 (S6 – Mercosur-EU agreement and The Free Trade of the Americas Agreement with trade cost elimination) *Baseline plus*:
Elimination of all tariff barriers between EU15/EU10 and Mercosur
Elimination of all tariff barriers in the Americas
Elimination of all trade cost estimates between EU15/EU10 and Mercosur
Elimination of all trade cost estimates between Mercosur and the RoAC.

products, light manufacturing (including electrical equipment) and services (financial construction, transport, communications etc.). On the other hand, Mercosur's comparative advantage lies in agro-food products with a net trade surplus of US$10.433bn and US$3.437bn with the EU and RoAC respectively. Equally, the EU is a large net importer of raw materials, whilst RoAC imports from Mercosur (largely dominated by the USA and motivated by lower per unit costs) are further concentrated in motor vehicles, metal products and wearing apparel.

TABLE 4
Trade Protection between Mercosur and the EU/RoAC

	Mercosur Imports From: EU	*Mercosur Imports From:* RoAC	*EU Imports From Mercosur*	*RoAC Imports From Mercosur*
	Ad Valorem Tariffs (Per cent)		*Ad Valorem Tariffs (Per cent)*	
Crops	5.4	1.5	3.7	9.7
Vegetables, fruits and nuts	9.8	10.6	13.4	2.8
Livestock	5.8	3.3	2.9	2.0
Other agriculture	0.8	11.3	1.3	1.6
Meat processing	11.3	8.3	66.9	7.4
Vegetable oils and fats	11.5	2.2	0.4	11.7
Dairy	18.0	16.0	33.0	35.6
Sugar processing	17.4	16.8	175.6	20.5
Other food processing	15.0	13.4	11.9	9.0
Beverages and tobacco	20.4	20.5	7.4	8.7
Raw materials	1.4	0.8	0.0	4.1
Textiles	17.6	16.4	5.7	10.6
Wearing apparel	19.2	13.5	3.5	8.2
Wood products	16.1	11.3	0.9	2.5
Paper and publishing	11.2	9.0	0.1	3.2
Chemical products	9.9	10.5	0.7	6.2
Metal products	13.2	11.2	2.9	4.7
Motor vehicles	12.1	6.2	1.3	6.7
Light manufacturing	13.1	11.8	0.1	4.3
Other manufacturing	17.7	19.0	0.0	5.4
Utilities	0.0	0.0	0.0	0.0
Services	0.0	0.0	0.0	0.0

Source:
Dimaranan and McDougall (2006).

Given the number of scenarios, we restrict ourselves to a discussion of the regional welfare estimates in Mercosur,[19] where values are real income changes in 2001 prices (US$ million), whilst the percentage improvement in real income is in per capita terms.[20] Moreover, results in the text are presented as model 'range' estimates to reflect both model variants (i.e. $Perfect Competition–$Imperfect Competition).

[19] A broader discussion of the results is available on request from the authors.
[20] The aggregate percentage real income gains are presented as per capita given the non-homotheticity of the private utility function in the GTAP model structure (Hertel, 1997).

b. Regional Welfare Results[21]

Table 6 shows the regional welfare results for S1, S2 and S3 relative to the baseline. Equivalent variation (EV) results are consistent with previous CGE Mercosur studies where trade-creation effects in both S1 and S2 prevail. In S1, Mercosur's real income gain is estimated at US$8.577–US$9.793bn (1.22 to 1.39 per cent per capita real income gain), whilst regional welfare under S2 improves US$7.937–US$8.615bn (1.13 to 1.22 per cent per capita real income gain), albeit less than in S1. In accordance with other CGE Mercosur studies, the welfare estimates in S3 are additive of both S1 and S2.

Disaggregating the welfare gains to Mercosur, over 60 per cent accrue on trade induced net (of depreciation) capital accumulation, which amounts to US$5.761–US$6.218bn in scenario one and US$5.433–US$5.645bn in S2. Allocative efficiency is measured as the real income value of changes in resource or product usage from reduction/elimination in a given market distortion (e.g. import tariff), where those activities which are taxed (subsidised) have a positive (negative) marginal social value (Huff and Hertel, 2001). In GTAP, welfare *changes* in efficiency are based on the quantity usage of a product multiplied by its tax/subsidy distortion in real income terms, where, for example, increased imports on a route with tariffs implies an efficiency welfare gain. Thus, gradual tariff reductions result in simultaneous import increases (*ceteris paribus*) leading to cumulative increases in efficiency of US$1.681–US$1.922bn in S1 and US$1.321–US$1.437bn in S2 relative to the baseline.[22]

In the CGE model, investment moves in tandem with fixed savings rates respecting the long-run empirical observation that domestic saving finances domestic investment (Francois et al., 1996). Thus, import substitution from unilateral tariff reductions would require export increases to restore the balance of payments balance. For this to occur, there must be a reduction in the real exchange rate (regional factor price index) to improve competitiveness implying export price reductions and, *ceteris paribus*, a terms of trade (ToT) deterioration. However, reciprocal tariff reductions by the RoAC (EU) in S1 (S2) stimulate export demand thereby muting the necessary degree of export price fall. Indeed, free access to RoAC (S1) and EU (S2) markets bids up Mercosur's factor price indices (see Table 5). Consequently, Mercosur receives a ToT gain of US$0.803–US$0.774bn in S1 and US$1.009–US$1.030bn in S2 (see Table 6). The trade-induced growth estimates in Table 6 measure the degree of productivity growth effects from 'technological transfer' as specified in Robinson et al. (2002). Given Mercosur's stronger import links with the RoAC in technologically embodied

[21] For a full discussion of EV welfare decomposition, see McDougall (2002).
[22] The implementation of a private consumption tax replacement scheme (see Section 4*a*) to offset lost tariff revenues has a dampening effect on allocative efficiency in that compensatory increases in private consumption taxes reduce private demands.

TABLE 5
Factor Price Changes in S1, S2 and S3

Per Cent Change vs. Baseline Factor Prices:	*PC S1*	*PC S2*	*PC S3*	*IC S1*	*IC S2*	*IC S3*
Land	3.83	40.79	42.34	3.99	42.44	43.62
Unskilled Labour	2.67	1.68	4.50	2.94	1.77	4.83
Skilled Labour	2.56	1.57	4.32	2.86	1.68	4.70
Capital	0.33	–0.43	0.32	0.41	–0.42	0.40
Natural Resources	2.81	–0.41	1.39	2.68	–0.45	1.23
Factor price index	1.67	1.17	3.06	1.86	1.25	3.31

Note:
PC – Perfect Competition; IC – Imperfect Competition.

TABLE 6
Welfare in Scenarios 1–3 Relative to the Baseline (US$ 2001 millions)

Perfectly Competitive Variant:	*S1*	*S2*	*S3*
Equivalent Variation (EV)	8,577.2	7,937.2	16,645.1
Per capita real income gain (per cent)	1.22	1.13	2.36
EV Decomposition:			
Allocative Efficiency	1,681.2	1,320.9	3,568.1
Terms of Trade	803.0	1,009.1	2,092.0
Trade-induced Growth	332.2	174.5	520.8
Trade Costs	0.0	0.0	0.0
Net Capital Accumulation	5,760.8	5,432.7	10,464.2
Imperfectly Competitive Variant:	*S1*	*S2*	*S3*
Equivalent Variation (EV)	9,793.4	8,614.8	18,384.2
Per capita real income gain (per cent)	1.39	1.22	2.61
EV Decomposition:			
Allocative Efficiency	1,922.2	1,437.1	3,900.8
Terms of Trade	774.4	1,029.6	2,073.7
Pro-competitive	502.1	312.9	760.1
Of which:			
Food Sectors	*38.2*	*240.9*	*263.4*
Non-food Sectors	*463.9*	*72.0*	*496.7*
Trade-induced Growth	376.8	190.7	574.9
Trade Costs	0.0	0.0	0.0
Net Capital Accumulation	6,217.9	5,644.5	11,074.7

intermediate imports, trade-induced growth estimates are higher in S1 compared with S2.

In imperfectly competitive sectors, liberalisation through tariff abolition results (*ceteris paribus*) in a rationalisation of firms, whilst output per-firm increases lead to efficiency gains through reduced average total costs and by assumptions of long-run zero profit and reduced mark-ups, output prices.[23] The regional pro-competitive estimates in Tables 6 and 7 are an aggregate of all firms' scale increases. In opening free trade with the RoAC (S1), most of the pro-competitive gains come from the non-food sectors (US$0.464bn). Indeed, given high benchmark data mark-ups (i.e. high concentration) and significant export increases with the RoAC, the majority of these gains come from the 'motor vehicles' sector (US$0.354bn – not shown). In S2, food manufacturing accounts for most of Mercosur's pro-competitive gain with the largest gains in the 'meat processing' sector (US$0.180bn – not shown).

c. Regional Welfare Results – Scenarios Four, Five and Six

In S4, S5 and S6, we incorporate the elimination of additional trade cost estimates. NTB trade costs measure the value of exogenous marginal value product improvements (variable AMS) in inputs. In a demand-driven model such as GTAP the definition of 'inputs' in the Armington import function includes both intermediate and final demand purchases. Thus, welfare improvements from trade cost removal represent greater trade possibilities from improved import 'efficiency' (i.e. lower 'effective' prices). In GTAP, this concept is measured by the increased value of imports (in real terms) made possible from eliminating frictional or iceberg costs from one region to another. It should be noted that sectors with high NTB equivalents do not necessarily contribute more to the 'trade cost' estimates in Tables 6 and 7, but rather NTB removal is tempered by the size of the trade flow to which it pertains and to a lesser extent the elasticity of substitution between competing imports.

Thus, the elimination of trade costs (see Table 7) stimulates considerable gains to Mercosur of US$24.065–US$24.082bn under the FTAA agreement (S4) and US$10.593–US$10.613bn under the EU RTA (S5) agreement, whilst the 'additive' trade cost gains in S6 are US$29.377–US$29.438bn. The boosting of (*inter alia*) intermediate input import demands through removal of iceberg costs also enhances trade-induced productivity gains through increased technology transfer. Moreover, increases in productivity growth in productive sectors, bolster demand for primary factors fuelling greater capital accumulation gains, which in the simulations account for over 40 per cent of the total welfare gain. In Table 7, trade-induced technology transfer and capital accumulation gains are US$2.589–US$2.801bn and US$35.866–US$37.989bn respectively (US$1.540–US$1.607bn

[23] This analysis is complicated in a general equilibrium specification, since it is possible that industry output may also decline as primary resources are diverted to sectors which are more trade competitive. Thus, as well as rationalisation in the number of firms, it is possible in some sectors that output per firm may also reduce.

TABLE 7
Welfare in Scenarios 4–6 Relative to the Baseline (US$ 2001 millions)

Perfectly Competitive Variant:	*S4*	*S5*	*S6*
Equivalent Variation (EV)	81,382.3	39,752.0	107,937.6
Per capita real income gain (per cent)	11.55	5.64	15.31
EV Decomposition:			
Allocative Efficiency	12,482.6	5,893.4	17,807.3
Terms of Trade	6,380.1	3,317.9	10,911.4
Trade-induced Growth	2,588.9	1,540.2	3,627.3
Trade Costs	24,064.5	10,592.6	29,376.6
Net Capital Accumulation	35,866.2	18,407.9	46,215.0
Imperfectly Competitive Variant:	*S4*	*S5*	*S6*
Equivalent Variation (EV)	87,343.1	42,127.8	114,751.2
Per capita real income gain (per cent)	12.39	5.98	16.28
EV Decomposition:			
Allocative Efficiency	13,730.1	6,346.3	19,221.7
Terms of Trade	6,207.1	3,350.6	10,684.1
Pro-competitive	2,534.0	977.1	2,941.8
Of which:			
Food Sectors	*215.4*	*329.8*	*476.6*
Non-food Sectors	*2,318.6*	*647.3*	*2,465.2*
Trade-induced Growth	2,801.0	1,607.0	3,864.9
Trade Costs	24,082.4	10,613.0	29,437.6
Net Capital Accumulation	37,988.5	19,233.8	48,601.1

and US$18.408–US$19.234bn respectively) in S4 (S5) compared with the baseline. Similarly, increases in Mercosur's import demands increases the efficiency gains by US$12.483–US$13.730bn and US$5.893–US$6.346bn in S4 and S5 respectively.

With greater economic growth in Mercosur under abolition of trade costs in S4, S5 and S6, expanding output sectors place additional burdens on resource endowments leading to further factor price rises. The resulting increase in Mercosur's export prices results in significant terms of trade increases. In S4, the terms of trade rise US$6.380–US$6.207bn, whilst corresponding figures for S5 are US$3.318–US$3.351bn.

Examining the imperfectly competitive model variants, pro-competitive welfare gains in S4 and S5 (Table 7) rise US$2.032bn and US$0.664bn respectively compared with the corresponding S1 and S2 in Table 6. As opposed to S2, the gains in S5 are now dominated by 'non-food' manufacturing sectors, particularly the 'motor vehicles' sector (US$0.438bn compared with the baseline – not shown). As in S1, 'non-food' manufacturing pro-competitive gains in S4 are considerably larger than 'food' manufacturing gains, over six and a half times the magnitude, where once again most of the non-food manufacturing gain emanates from the motor vehicles sector (US$1.419bn compared with the baseline – not shown).

Finally, the long-run EV estimates across both model variants in S4 and S5 for Mercosu are US$81.382–US$87.343bn and US$39.752–US$42.128bn respectively. This translates into long-run per capita real income growth estimates of between 11.55 and 12.39 per cent in S4 (5.64 and 5.98 per cent in S5). The combined opportunity cost of both trade deals (S6) is US$107.938–US$114.751bn (15.31 to 16.28 per cent per capita real income growth).

6. CONCLUSIONS

After six years of stop-start negotiations, Mercosur is still no closer to signing a long-awaited regional trading agreement (RTA) with the EU, whilst talks between 33 countries of the American continent, including Mercosur, to finalise a Free Trade Agreement of the Americas (FTAA) have also stalled. The lack of progress has been fuelled in part by economic crises in the Mercosur zone, intransigence by member countries and uncertainty surrounding the timing and commitment levels in the current Doha Round.

As an initial objective, we follow Monteagudo and Watanuki (2003) in examining the welfare gains to Mercosur from an EU RTA and an FTAA. Despite an array of different data sources, benchmark years and trade elasticity estimates, our CGE results concur with the literature in three respects. Firstly, trade creation outweighs trade diversion (i.e. net trade-creating policies) resulting in welfare gains to Mercosur; secondly, pro-competitive effects magnify welfare gains; and finally the results in scenario three are largely additive of scenarios one and two. Notwithstanding, estimates in scenarios one and two are at the lower range compared with the literature since Doha Round and EU enlargement tariff cuts appear in our baseline, which account for part of the welfare, whilst this study also uses the latest GTAP version six data benchmarked to 2001, which, due to ongoing liberalisation in the Uruguay Round, has lower tariff peaks than other similar studies which employ an earlier benchmark year. Moreover, contrary to Diao et al. (2003) and Monteagudo and Watanuki (2003), the gains to Mercosur from an EU RTA are smaller than the FTAA scenario.[24]

A further common feature with Monteagudo and Watanuki (2003) is that we calibrate non-tariff barrier tariff equivalents into the CGE model to examine the additional impacts on Mercosur's welfare from both trade deals. Importantly,

[24] This empirical finding is consistent with the endogenous FTA literature cited in the introduction of this paper. Namely, that the FTAA is intercontinental thereby maximising trade creation, whilst their distance from the rest of the world minimises trade diversion.

we improve on their study by employing a theoretically consistent gravity specification and recent developments in the literature, to estimate NTBs by sector and region. The results show greatly increased welfare gains to Mercosur, whilst the FTAA deal (scenario four) becomes considerably more beneficial for Mercosur than the EU RTA deal (scenario five). This is due to Mercosur's greater reliance on the rest of the American continent imports (i.e. greater trade cost benefits) and in particular technologically embodied trade (greater trade-induced productivity).

A secondary objective of this paper is to revisit the claim by Monteagudo and Watanuki (2003) that removal of trade costs 'doubles' the welfare gains to Mercosur. Comparing corresponding scenarios, our results suggest that welfare gains are magnified by a factor of five (scenario five vs. scenario two) and nine (scenario four vs. scenario one) respectively. There are two main reasons for this difference. The first alludes to the fact that the *absolute* values of our benchmark NTB tariff equivalents, particularly in non-food sectors, are higher than those used in Monteagudo and Watanuki (2003) (as noted in Section 3*c*). Furthermore, in the services sector, Monteagudo and Watanuki (2003) do not incorporate an NTB equivalent estimate, whilst the GTAP data (Dimaranan and McDougall, 2006) show that Mercosur's service sector accounts for 26 per cent and 60 per cent of the value of extra-region imports sector output respectively. Secondly, Monteagudo and Watanuki (2003) use a traditional static treatment of investment, whilst in this study we employ a (static treatment) capital accumulation function, which brings significant additional welfare gains to Mercosur.[25] In other words, our welfare gains should be considered as (quasi) long run, whilst theirs are medium-term forecasts.

Thus, with larger (and broader sectoral coverage of) NTB equivalents, the removal of trade costs leads to greater welfare gains, whilst also *magnifying all remaining components of the welfare decomposition*. Thus, increases in import quantities augment efficiency gains, whilst greater flows of technologically embodied intermediate input imports (particularly services inputs) to Mercosur also boost Mercosur's trade productivity gains.[26] Furthermore, additional regional growth from productivity improvements coupled with tariff removal creates larger pro-competitive effects, whilst greater primary factor demands (i) significantly increases capital accumulation (which, as noted above, does not occur in Monteagudo and Watanuki, 2003) and (ii) further bid-up factor prices leading to ToT improvements.

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[25] Our results suggest that capital accumulation brings over 40 per cent of the welfare gains in scenarios four, five and six.

[26] An increase in the value of the technology transfer elasticity parameter from 0.1 and 0.5 shows that Mercosur's per capita real income gains may be increased by up to 56/57 per cent for the two model variants compared with the baseline. Moreover, the positive relationship between the size of the elasticity parameter and changes in per capita real income gains, is linear.

To some extent the magnitude of these additional gains is to be expected given the size of the benchmark NTB tariff equivalents extrapolated from the gravity model. Indeed, in an EU enlargement study by Lejour et al. (2004), the removal of gravity estimated NTBs alone yields CGE growth gains of between 2.5 and 3.5 for the Eastern accession members. On the other hand, the additional linkage between NTB removal and (*inter alia*) welfare-enhancing technology transfer and capital accumulation effects, suggest that the results should be considered as upper-bound long-run estimates.

A few caveats to the analysis are also in order. It should be noted that a neoclassical long-run multi-region CGE representation has little to say about the macroeconomic structural challenges (fiscal balance, exchange rate volatility, frictional movements in labour) that face trading partners from resource reallocations. Moreover, the results of these simulations should be treated with caution in that they do not shed light on issues of welfare distribution or poverty alleviation from any hypothesised trade deal. Notwithstanding, the results indicate firmly that the hidden benefits of deeper market integration are a priority, not only for Mercosur, but also in fostering trade-led development and growth within a multilateral context.

APPENDIX

Values of Gravity Variables in the Composite Regions

The countries included in the gravity analysis are: each of the (pre-enlargement) members of the EU; each of the recent ten EU accession members; Alaska, Argentina, Brazil, Canada, Chile, Colombia, Mexico, Peru, Uruguay, the US and Venezuela. The rest of the countries are aggregated as: Central America, Rest of Andean Pact, Rest of Caribbean, Rest of South America, Rest of FTAA, Rest of the World.

To calculate distances from a composite to an individual country, an arbitrarily capital city of the aggregated area was selected. The selections made are: Central America or CACM, Guatemala City (Guatemala); Rest of Andean Pact, Quito (Ecuador); Rest of Caribbean, Habana (Cuba); Rest of Free Trade Area of America or CARICOM, Kingston (Jamaica); Rest of North America, Juneau (Alaska); Rest of South America, Asunción (Paraguay); Rest of the World, Nairobi (Kenya).

To calculate the internal distances of the composites, an average of all the bilateral distances between capitals is calculated. In the Rest of the World composite, a country/capital in each continent has been selected, and then an average of the bilateral distances between these selected countries is calculated. These selected capitals (countries) were: Beijing (China) for Asia; Nairobi (Kenya) for Africa; Bern (Switzerland) for Europe; and Canberra (Australia) for Oceania.

To choose a value for the contiguity ($CONT^{ij}$) variable when at least one of the countries involved is a composite, a value of one is assigned if there is a common border either with all the countries within the composite or with the country with the highest GDP of the composite. The common-language variable ($LANG^{ij}$) when at least one of the trade partners is a composite, takes a value of one when the country shares any of the languages spoken by the composite.

The quantitative variables, exports, GDP variables, population (used for per capita indicators) and infrastructure indicators, are aggregated across the countries within the composites to calculate the overall composite value. The price index, are averages of the individual price indices across the countries involved in the composite.

Calibration of Firm Numbers

In this model, we refrain from employing imperfect competition in 'services' sectors since data on concentration ratios were not available. In other cases we extrapolate or infer concentration ratio data from relevant sources where necessary.

Following Elbehri and Hertel (2003), the Cournot mark-up condition can also be derived as:

$$\frac{P - MC_i}{P} = \frac{H}{\varepsilon}, \tag{A1}$$

where H is the Herfindahl index of concentration which is the sum of the squared market shares of all n firms in the industry, and ε is the inverse elasticity of demand for the industry tradable. Assuming a standard Cournot-Nash conjectural variation value (Ω) of 1, then $H = (1/N)$. Thus, for the EU15 and ROW we borrow Herfindahl estimates from Elbehri and Hertel (2003) to calibrate benchmark firm numbers. Given data constraints, for the EU10 we employ the HHI statistics for the EU15.

For Mercosur and the Rest of the American continent, three data sources are used. For Brazil we employ data from the Instituto Brasileiro de Geografia e Estatistica, Annual Industrial Survey, 1996. For Mexico, Instituto Nacional de Estadistica Geografia e Informatica, Censos Economicos, 1994, Sistema Automatizado de Información Censal 3.1. For the USA, US 1997 Census data for manufacturing and services industries. The data for Mexico and Brazil are cost structure data which allow us to estimate the cost disadvantage ratio (CDR) measure of economies of scale for each industry given as:

$$CDR = \frac{AC - MC}{AC} = \frac{FC}{TC}, \tag{A2}$$

where AC, MC, FC and TC are average, marginal, fixed and total costs respectively. As we assume long-run zero-profits with freedom of firm entry and exit, the ratio FC/TC is equivalent to the mark-up in equation (A1). The US census data provides detailed Herfindahl data for US manufacturing industries, thereby allowing calculation of benchmark firm numbers through the use of (A1). The Mercosur composite is assumed to have the same mark-ups as Brazil. For the Rest of the American continent, a weighted average is calculated based on the known regions (Brazil, Mexico and the USA).

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