Sector-specific bilateral trade and currency unions

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Abstract

Empirical estimations of the gravity equation for international trade have proven to be useful tools for explaining the pattern of bilateral, aggregate trade ((see Evenett and Keller (2002)). The development of a commodity-specific gravity equation by Anderson and Yotov (2010) permits bringing the useful tool of gravity to explaining trade of particular commodities or classes of goods.

This paper brings to disaggregate trade the analysis brought to previous panel studies of worldwide, aggregate, bilateral trade (see Glick and Rose (2002), Baier and Bergstrand (2007), Baier and Bergstrand (2009), and Head et al. (2010) among others). In contrast to previous studies such as Lambert and McKoy (2009) and Vollrath and Hallahan (2011), this paper uses a gravity equation designed specifically for disaggregate, rather than aggregate, trade. The paper gives particular emphasis to trade within currency unions, such as the CFA zones in Africa, the East Caribbean Currency Union (ECCU), the Eurozone, and the Rand zone around South Africa. This paper estimates the commodity specific gravity equation using the Pseudo-Poisson Maximum Likelihood estimation in order to explain the determinants of trade for agricultural trade and manufacturing trade separately. The paper uses a panel of all available country pairs ranging from 1976 to 2010 (for agricultural trade) and from 1980 to 2010 (for manufacturing trade). Data come from the UN COMTRADE database, the TRAINS database (both maintained by WITS), and the UNIDO INDSTAT database.

The most significant determinant of agricultural trade is whether or not a country pair consists of a former colonial power and one of its former colonies. Though this relationship also matters for manufacturing trade, the effect is moderate when compared with agricultural trade. However, two countries being former colonies of the same colonizers is a better predictor of manufacturing trade than of agricultural trade, where "better" signifies that the marginal effect is larger for manufacturing trade than for agricultural trade. Additionally, regional trade agreements, a common currency, and a common language are better predictors of manufacturing trade than of agricultural trade.

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The effect of a common currency on trade differs widely across currency unions and between types of traded goods. The West African Economic and Monetary Union (UEMOA), the Rand zone, US-Dollarized countries, and the anchor-client relationship of India-Bhutan exhibit modestly higher levels of intraunion agricultural trade than otherwise similar countries. In contrast, the ECCU, the Central African Economic and Monetary Union (CEMAC), the UEMOA, the Australian Dollar zone (Australia, Kiribati, and Tonga) and India-Bhutan demonstrate significantly higher levels of intraunion trade in manufactured goods. The Rand zone demonstrates a modestly higher level of intraunion trade in manufacturing.

The paper further disaggregates manufacturing trade into 2 groups of ISIC 3 2-digit classifications: 15-19 and 20-37. The determinants of trade in the former set of goods, consisting of food products and textiles, resemble the determinants of trade in agricultural goods generally. However, a trade agreement is a more important factor for goods classified 15-19 than for goods classified 20-37, in contrast to the results from the more aggregated models. The paper also isolates trade in textiles for analysis. Textile trade is defined as trade in goods belonging to division 17 in the ISIC Revision 3 classification system. The determinants of textile trade are largely similar to the determinants of trade for the broader category of goods with codes 15-19. Currency unions, regional trade agreements, and colonial heritage tend to matter more for the broader category of trade than for textiles.

1 Introduction

The effect of a common currency on trade has received significant attention in the past decade. Starting with the work of Andrew Rose (Frankel and Rose (1998), Rose (2000), Rose and van Wincoop (2001), Glick and Rose (2002)), researchers have generally found large effects of a common currency on trade for currency unions. However, Whitten (2012) demonstrates that only a few of the currency unions previously studied (such as the East Caribbean Currency Union and the West African Economic and Monetary Union) demonstrate as high of a level of integration by trade as found in the above-mentioned studies. Whitten (2012) also shows that the extent of integration is closely related to tariff levels. In particular, the higher the level of tariffs prevailing across the currency union, the greater is the intra-union trade. When controlling for tariffs, the results indicate that a common currency appears to have little direct impact on the costs to trade. Consequently, a common currency has little direct impact on the volume of trade. However, in the presence of high tariffs, an importer is more likely to favor an exporter located in a country that uses the same currency as does the importer, in order to reduce additional trade costs, the implication of the afore-mentioned results. Consequently, trade and tariffs are *positively* correlated within a currency union. Therefore, a common currency's largest effect on trade is an indirect effect, through tariffs. The positive correlation accounts for the large effects of a common currency on trade found in previous studies.

Left unanswered in the discussion above is the question of *why* currency unions should differ along the particular dimensions of trade enhancement via tariffs. Why should tariffs appear to expand integration for some unions but not for others? This paper proposes the analysis of disaggregated trade as the first step to answering this question. Recall that a common currency's relevance as a control variable for studying bilateral trade owes itself to the ability to forego transaction costs for purchasing foreign exchange (see Rose (2000), Rose and van Wincoop (2001), and Anderson and van Wincoop (2004)). Anderson and Yotov (2010) note that trade costs generally differ depending on the nature or characteristics of the goods being traded.

Tariffs are unarguably a key trade cost and differ across commodity types. As a stylized fact, tariffs on agricultural goods and low-skilled-intensive manufacturing goods tend to be higher than are tariffs on other manufactured products, which in turn are higher than are tariffs on resources such as minerals or petroleum. This pattern holds for both developed and developing countries (see Cline (2004)). If the common currency has a differential impact on trade by commodity type and if the tariff variable is the sole variable able to distinguish the composition of a trade flow (owing to the afore-mentioned stylized fact), it is unsurprising that the tariff-currency union interactions would absorb the existence of a differential effect by commodity type. Thus, the very significance of tariffs within currency unions demonstrated in Whitten (2012) suggests that the ability of a common currency to enhance intra-union trade by reducing trade costs will differ across unions as the composition of trade differs across unions.

This paper investigates sectoral differences in trade patterns across currency unions. This paper combines two strands of literature. The first strand is a long-standing literature examining the effect on trade of hedging exchange rate volatility by focusing on currency unions (in addition to the works of Rose, see Persson (2001), Micco et al. (2003), Klein (2005), Barro and Tenreyro (2007), Santos Silva and Tenreyro (2010)). The second strand of literature is the examination of trade determinants for disaggregated trade (Anderson and Yotov (2010), Cissokho et al. (2013)). This literature emphasizes that trade costs, controlling for which is a crucial step in any empirical analysis of trade, differ across product types. The gravity equation or gravity-like equations have proven to be a useful framework for analyzing aggregate trade flows and for estimating the magnitudes of different variables on total trade costs (Eaton and Kortum (2002), Evenett and Keller (2002), Santos Silva and Tenreyro (2006), Head et al. (2010)). Therefore, a framework that can bring the key elements of the gravity equation (national output by product type, iceberg trade costs or "bilateral resistances," and traded good price indices or "multilateral resistances") to an individual sector can bridge the two literatures to bring the well-established success of using the gravity framework to a reliable and informative analysis of disaggregate trade flows. To this end, Anderson and Yotov (2010) develop a gravity model for an individual class of goods, similar to the structure developed in Anderson and van Wincoop (2003). Though Anderson and Yotov (2010) develop sector-specific gravity equation of bilateral trade to examine the incidence of trade barriers on exporters and importers, this paper is the first known use of sector-specific gravity to analyze currency unions.

Though fewer in number than panel studies of aggregate bilateral trade, several papers in this combination of strands have examined bilateral trade at a disaggregate level, particularly for trade in agircultural goods. Lambert and McKoy (2009) examine 3 different cross-sections of bilateral trade to study the effect of preferential trade agreements on agricultural trade. Vollrath and Hallahan (2011), the most similar work to this paper, also studies the effect of trade agreements on agricultural trade, though with a panel study. Both Lambert and McKoy (2009) and Vollrath and Hallahan (2011) adapt the gravity equation as articulated in Anderson and van Wincoop (2003) directly to a panel study of bilateral agricultural trade by replacing aggregate exports with agricultural exports. This adaptation is valid under the assumption of a constant expenditure share on a particular class of goods over the duration of the panel. The model proposed in Anderson and Yotov (2010) does not restrict the share to be constant over time.

Most empirical work concerning currency unions has examined aggregate trade. However, the early literature on currency unions suggests that the composition of production (and, by extension, trade) plays a key role in analyzing the motivation for and consequences of sharing a common currency. Mundell (1961) argues for defining a common currency over a region of economic activity where all sub-regions pass through the same phases of the business cycle at the same time. In particular, the shocks to the business cycle that Mundell emphasizes are sector-specific shocks. Hence, Mundell creates a strong association between an optimal currency area and a particular industry. McKinnon (1963) states that a country's decision to fix its exchange rates with trading partners or to maintain an independent currency will depend on the composition of tradable and non-tradable goods within its economy. The composition of tradable and non-tradable goods likely differs across regions of the world. As a currency union generally consists of countries within the same geographic region, an understanding of how tradable goods and non-tradable goods differ across the set of currency unions becomes an important consideration when analyzing a currency union and its performance.

Despite the strong theoretical motivation for considering the composition of production and currency unions, empirical work analyzing the intersection of currency union membership and heterogeneity in trade composition is limited. Rose and Engel (2002) finds weak evidence that currency unions display greater specialization in production and, hence exports. Gulde and Tsangarides (2008) compares and contrasts the performance of the two zones within the *Communauté financière africaine*, the CEMAC and the UEMOA, given the importance of petroleum extraction in the CEMAC. The contribution of this paper is to explore and compare systematically the extent of integration across currency unions and sector of trade.

This paper uses sector-specific gravity equations of bilateral trade to show that different currency unions have different degrees of trade across different sectors. Several unions (the ECCU, UEMOA, CEMAC, Rand zone, Australia zone, Danish zone, and India-Bhutan) display a high level of integration through trade in manufacturing. The Eurozone and Dollarized zone, by contrast, demonstrate little integration through trade in manufacturing but exhibit a modest level of integration through trade in agriculture. Considering the trade in manufactured goods more closely, this paper shows that currency unions demonstrate differing levels of integration through trade within more narrowly-defined manufacturing sectors. In particular, trade is highest for the ECCU, CEMAC, UEMOA, Australia zone, and Danish zone for goods classified with 2-digit ISIC Revision 3 codes ranging from 20 to 37. India and Bhutan as well as Dollaried countries exhibit a slightly higher degree trade integration for industrial activity classified with 2-digit ISIC codes ranging from 15 to 19. The ECCU, CEMAC, UEMOA, Australia zone, Danish zone, and Dollarized zones also exhibit increased trade, though of a smaller magnitude, for industries with codes 15 through 19.

The organization of the paper is as follows. Section 2 presents the sectoral gravity equation and discusses the estimation procedure and the sources of data. Section 3 presents results from one level of disaggregating aggregate trade into agricultural trade and manufactured goods trade.[1] Section 4 presents results from a further disaggregation

[1]Data on trade in services are not sufficiently and widely available for developing countries. Hence,

of manufactured goods trade. Section 5 presents results from a particular division of manufacturing (textiles).

2 Sectorial gravity equation and data

Following Anderson and Yotov (2010), I estimate a gravity equation for exports in a specific class of goods, k, from country i to country j of the following form:

$$X_{ij}^{k} = \frac{Y_i^k E_j^k}{Y^k} \left(\frac{b_{ij}^k}{\Pi_i^k P_j^k} \right)^{1-\sigma_k} + \epsilon_{ij}^k \quad \sigma_k > 1 \tag{1}$$

where X_{ij}^k represents exports, Y_i^k represents the production of goods in class k, E_j^k represents expenditures on goods in class k, and Y^k is the sum of Y_i^k over all i: $Y^k \equiv \sum_i Y_i^k$. b_{ij}^k represents bilateral trading costs. I will proxy for these costs with the rich set of controls used frequently in aggregate gravity equations and described at the end of this paper in an appendix. $\left(\Pi_i^k, P_j^k\right)$ are price indices. I will control for these variables with time-varying country dummy variables. σ_k is the elasticity of substitution for class k. ϵ_{ij}^k is the error term.

E_j^k is not observed for most countries. Anderson and Yotov (2010) resolve this problem in their paper by including a country fixed effect for j in the regression. This fixed effect also controls for P_j^k. A separate country fixed effect for i controls for Π_i^k.

The data are a panel of country pairs at yearly frequency from 1976 to 2011 (for agricultural data) and from 1980 to 2011 (for manufacturing data). Data on trade come from UN COMTRADE while data on tariffs come from UNCTAD TRAINS, both part of World Integrated Trade Solutions (WITS). When possible, agricultural and manufacturing are defined according to ISIC Revision 3, first introduced in 1988. For data from

this paper ignores trade in services.

earlier years and for countries that maintained ISIC Revision 2 as the nomenclature for classifying industrial activity, the ISIC Revision 2 classification is used (1976-1995). Data on world agricultural and manufacturing output come from the the World Bank's *World Development Indicators* and from the UNIDO INDSTAT databases.

The control variables that compose the b_{ijt} include the currency union relationships, distance, other economic and geographic features, and colonial heritage. I use the CEPII database for Great Circle distances, augmented with information obtained from the CIA Factbook and from `http:\\www.timeanddate.com`.[2] As the CEPII data political relationships is time-invariant and as my period of interest spans the European decolonization of Africa and Southeast Asia, I use the independence dates provided by the Factbook in order to construct time-varying measures of political relationships. Information on regional trade agreements comes from the WTO's Regional Trade Agreement (RTA) database, augmented with information provided by the various secretariats of the RTAs on changes in RTA membership. Currency union membership comes from Glick and Rose (2002), augmented by IMF staff reports and other publications. Unlike Glick and Rose (2002) whose paper emerged shortly after the introduction of the Euro, I include the Eurozone as a currency union. The term currency union in this literature refers not only to formal unions such as the EMU or CFA but also to countries that fix their own currency to or use the currency of another country, such as the use of the US Dollar in El Salvador and Liberia. A list of currency union members and a full list of definitions of the other proxy variables for bilateral resistance can be found at the end of the paper. I refer to the Eurozone as countries in the EMU and those that have adopted the euro unilaterally (such as Macedonia).

A preliminary look at the trade data shows a common pattern across currency unions and important variations in this pattern. Table 1 reports averages over time of agricultural

[2]The CEPII database has been since replaced with a dataset constructed by Keith Head, Thierry Mayer and John Ries.

Table 1: Average shares of merchandise exports for currency unions, 1960-2011 (standard deviations in parentheses)

Currency Union	Agricultural exports	Manufacturing exports
Australia zone	10.997	15.183
	(10.012)	(5.898)
CEMAC	22.058	15.765
	(10.633)	(6.643)
Danish zone	3.178	31.131
	(1.636)	(11.875)
Dollaried zone	3.583	38.217
	(2.416)	(11.499)
ECCU	0.402	29.514
	(0.543)	(12.863)
Eurozone	1.785	77.849
	(0.204)	(2.86)
India-Bhutan	3.61	58.463
	(2.28)	(10.39)
Rand zone	3.941	61.524
	(2.231)	(9.901)
Singapore-Brunei	4.909	37.686
	(5.539)	(23.182)
UEMOA	24.211	13.542
	(10.939)	(7.262)

exports as a share of merchandise exports and average of manufacturing exports as a share of merchandise exports for the member countries of the currency unions studied in this paper.[3] In general, trade in manufacturing goods represents a large portion of exports for currency union countries, especially compared to agriculture. The exceptions to this pattern are the CEMAC and UEMOA. The significance of manufacturing trade varies widely, accounting for between 30% and 40% of merchandise exports for the Dollairzed zone, the ECCU, and India-Bhutan while accounting for well over half of exports for the Eurozone, the Rand zone, and India-Bhutan.

[3]These shares are for all export destinations, not just to fellow currency union countries. Additionally, according to the *World Development Indicators*, "Merchandise export shares may not sum to 100 percent because of unclassified trade."

The volatility of these shares over time differs noticeably across unions. Figures 1 and 2 show exports in each sector, agricultural and manufacturing, as a percent of total merchandise exports for currency unions over time. The series for agricultural exports in the CEMAC and UEMOA display substantial volatility while agricultural exports represent consistently small shares of exports from other currency union countries. Consequently, the data suggest that if a common currency has an effect on facilitating trade in a particular sector, the sector is likely to be the manufacturing sector.

Table 2: Average tariffs (%) for currency unions, 1988-2011 (standard deviations in parentheses)

Currency Union	Agricultural imports	Manufacturing imports
Australia	0.105	1.09
	(0.19)	(1.7)
CEMAC	22.69	21.55
	(5.32)	(2.7)
ECCU	28.29	16.91
	(5.8)	(2.9)
India-Bhutan	25.97	39.69
	(14.23)	(26.44)
Singapore-Brunei	0.76	1.72
	(0.10)	(0.88)
Rand Zone	4.3	11.86
	(1.99)	(2.82)
Dollarized zone	4.29	7.41
	(2.62)	(2.28)
UEMOA	14.75	15.3
	(2.89)	(3.05)

The tariff data indicate distinct levels of tariff rates across different classes of goods (see table 2). However, unlike the conclusion in Cline (2004), agricultural tariffs are not uniformly higher over countries and over time than are manufacturing tariffs. Table 2 shows that only the ECCU member countries possess an average tariff rate on agricultural imports over time that is consistently higher than is the average tariff rate on manufacturing imports. Figures 3 - 10 present the time series of tariff rates over time for each currency union. The CEMAC, ECCU, and India-Bhutan all have agricultural tariff rates that are higher than are the tariff rates on manufacturing goods for a large share of time. In contrast, the UEMOA, Dollarized countries, Singapore-Brunei, and Australian zone have tariffs on manufacturing goods that are generally higher than are the tariffs on agricultural goods. Both agricultural tariffs and manufacturing tariffs follow a generally downward trend.

3 Results from one level of disaggregation: agriculture versus manufacturing

3.1 Estimation and reporting of results

I estimate equation 1 using OLS and using Pseudo-Poisson Maximum Likelihood (PPML) estimation described in my first chapter with errors clustered on exporter-importer pair. The estimating equation formally is:

$$\begin{aligned} X_{ijt}^k &= \exp \alpha_1 \ln \Bigg(Y_{it}^k + \alpha_2 \ln Y_t^k + \sum_{r=1}^{T}\sum_{u=1}^{C} \gamma_{ru} d_{ru} + \sum_{s=1}^{T}\sum_{v=1}^{C} \gamma_{sv} d_{sv} \\ &\quad + \beta \cdot b_{ijt}) + \upsilon_{ijt} \end{aligned} \tag{2}$$

where d_{ru} is a dummy variable equal to 1 if $u = i$ and if $t = r$, else 0. A similar definition applies to d_{sv}. These variables control for the (P_{jt}, Π_{it}) or multilateral resistance terms.

Though gravity equations similar in form to equation 1 have been estimated traditionally with OLS on a logarithmic transformation, Santos Silva and Tenreyro (2006) identifies problems with this approach. In particular, applying a logarithm to the variables for the regression fundamentally distorts the stochastic properties of the data and leads to inconsistent estimators. Santos Silva and Tenreyro (2006) propose PPML as a convenient way to estimate non-linear trade models in levels.

Since the PPML estimation is a non-linear estimation procedure, the estimated coefficients are not the estimated marginal effects of the level of the regressors on the level of trade. The marginal effect of a regressor on the dependent variable is the statistic of interest. However, ratios of coefficients are ratios of marginal effects. The values reported in the tables are not coefficients but ratios of coefficients. In linear and in non-linear models, ratios of coefficients are ratios of marginal effects. In particular, the value for any variable x is given as:

$$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$$

and is referred to as the *relative* effect. The negative sign preserves the intuition regarding the influence of x on trade, given that the log of distance has a negative, significant effect on trade in all regressions. The reported p-values are associated Wald tests of the null hypothesis that the afore-mentioned ratio is equal to 0.

3.2 Results

3.2.1 Agriculture versus Manufacturing

For baseline results, see tables 6 and 7. As a point of comparison with results from the aggregate gravity equation, see tables 4 and 5, reproduced from Whitten (2012). Generalizing the results from this paper, the estimated effects of bilateral resistance are larger for manufacturing trade than for agricultural trade. The exceptions to this pattern are for the colonizer-colonized variable; the transitional colony variable (a country pair where one country has gained independence from a colonial empire while the other country has not); and the generic common currency variable. While the first two variables are insignificant for manufacturing trade and significant for agricultural trade, the latter is positive and significant for agricultural trade but negative and significant for manufacturing trade. Interpreted literally, the results suggest that a common currency predicts increased intraunion agricultural trade but decreased intraunion manufacturing trade.

Allowing a common currency to have different effects across currency unions leads to noticeably different results when comparing agricultural trade with manufacturing trade. The currency union effects in manufacturing trade are generally larger than are those for agricultural trade, based on comparing tables 8 and 9. The ECCU, the UEMOA, the Australia zone, the Krone zoner, and India-Bhutan all have relative effects on manufacturing that are larger than are the effects on agricultural trade. The Rand zone, the Eurozone, and Dollarized zone are exceptions to the stylized fact that effects of a common currency on manufacturing trade are larger than are the effects on agricultural trade.

Larger estimates of bilateral resistances for agricultural trade than for manufacturing trade may not be too surprising for two reasons. First, a worldwide currency such as the U.S. dollar is generally the currency used for pricing and then purchasing agricultural goods (see Pick and Carter (1994)). Hence, a common currency other than the US dollar may offer little benefit to foreign trade in agricultural goods. Second, as agricultural products are often homogeneous across producers, the gravity equation, often motivated through the supposition of a CES objective function, may not be appropriate, owing to the lack of "love-of-variety"-like motivation.

3.2.2 OLS versus PPML

To demonstrate the discrepancy between estimating equation 1 in levels with the PPML method versus with OLS on a logarithmic transformation, compare table 10 with table 6 and table 11 with table 7. The OLS results in tables 10 and 11 show nearly no effect of a common currency for agricultural trade but a positive and significant effect for manufacturing trade. In contrast, the PPML results show that the effect of a common currency on trade is positive and significant for agricultural trade but negative and significant for manufacturing trade.

Relative effects for other variables differ, too, both for agricultural trade and for manufacturing trade. For agricultural trade, The PPML estimation shows that the exporter's output, the total world output, the presence of a regional trade accord, matter to a larger extent than that shown by the OLS estimation. The OLS estimate gives a large and significant effect to countries that are still colonized by others while this relationship has an insignificant effect under PPML. A country pair with colonizing and colonized countries has a relative effect half as large under PPML as under OLS. The transitioning-colony variable is significant and positive for OLS but significant and negative for PPML. Both estimation methods yield a positive and significant effect for a country pair where both members have gained independence from the same third country. This effect is slightly larger under PPML than under OLS. In contrast, a common border is slightly less important under PPML than under OLS, but positive and significant in both cases. OLS predicts that a common language is significant and positive while PPML predicts that a common language is insignificant.

The difference between estimates from OLS and PPML for manufacturing trade roughly mirrors the difference between estimates for agricultural trade. The PPML approach estimates a larger effect for output and a trade agreement than does the OLS approach. Colonial heritage is generally insignificant for PPML, except for a country pair where both members have gained independence from the same third country. Unlike agricultural trade, a common border is more important under PPML than under OLS for manufacturing trade. Also unlike agricultural trade, a common language is significant under PPML and possesses a larger relative effect than does it under OLS.

3.2.3 Tariffs

Recall that the significance of tariffs for aggregate trade in table 5 may arise from a combination of two factors. Suppose that a common currency has a differential impact on trade by commodity type, a particular case of the general situation suggested by Anderson and Yotov (2010) regarding trade costs. Note that for aggregate trade in table 5, the tariff variable is the sole variable able to distinguish the composition of a trade flow. If a common currency does have a differential impact on trade by commodity type, then studying agricultural trade separately from manufacturing trade should reduce the significance of tariffs in explaining trade within a currency union.

Controlling for all trade costs by including tariffs reduces the magnitude of the statistical significance and/or the magnitude of the relative effects of currency union membership, similar to the case for aggregate trade (see tables 12 and 13). For agricultural trade, the UEMOA and Dollar zones lose their significance. All stand-alone or inherent currency union relative effects become insignificant. The tariff and currency union membership interactions for the ECCU and India-Bhutan are positive and significant. For manufacturing trade, the ECCU retains a large, significant relative effect when controlling for tariffs. The relative of effect of the CEMAC retains its significance and increases in magnitude. The UEMOA, Dollar zone, and India-Bhutan lose significance and/or decrease in relative effect. The log of tariffs is significant and negative for agricultural goods but insignificant and negative for manufactured goods.

The interactions between currency union membership and tariff rates for disaggregated trade are generally positive, as is the case with aggregate trade. Yet unlike the case for aggregate trade, the interactions are generally insignificant or less significant, especially for agricultural trade. Two tariff interactions between currency unions and tariff rates for agricultural trade are positive and significant (the ECCU and India-Bhutan). However, only one currency union, the UEMOA, has a tariff interaction with a negative effect. Recall that the UEMOA-tariff interaction for aggregate trade also was negative and significant. Two tariff interactions between currency unions and tariff rates for manufacturing trade are positive and significant (the Australian zone and India-Bhutan). Most others are positive and insignificant, though manufacturing trade in the Dollar zone has a negative and significant interaction. Comparing the point estimates of the relative effects within the same currency union but across goods type shows that agricultural trade has larger effects than does manufacturing trade.

How do these results inform our assessment of the results in Whitten (2012)? Does the interpretation of the role of tariffs change, given fewer instances of statistical significance for tariff and currency union membership interactions? Recall that the results from tables 8 and 9 show that the currency effects are larger for manufacturing trade than are the for agricultural trade. Tariffs represent the only variable that can distinguish the composition of a trade flow. Suppose that two trade flows are of equal, pre-tariff value, but differ in their composition. If one trade flow contains a greater share of high-tariffed goods than does the other trade flow, then the common currency facilitates the former trade flow to a greater extent than does the latter trade flow. Hence, the interactions on common currency and the level of tariff rates are significant in a regression of aggregate trade flows as no other variable reveals heterogeneity in trade flow composition. Separating trade flows by composition in a way that leads to a relatively high-tariff rate type of trade (agricultural) and a relatively low-tariff rate type of trade (manufacturing) necessarily reduces the variance of tariff rates within the trade flow of each type. Thus, the tariff rate itself becomes less significant in predicting trade within a currency union as the common currency's effectiveness at facilitating trade in the presence of high tariffs is preempted by the separation of trade flow regressions by commodity, and, tariff-rate (low versus high) type. Recall also that the particular class of high tariffed goods in this decomposition, agricultural goods, contains goods that are generally transacted in a particular currency, the U.S. dollar. Therefore, variables pertaining to the sharing of a common currency other than the U.S. dollar across countries are unlikely to have a significant influence in determining trade. The point estimates of the relative effects for currency union-tariff interactions are generally larger for agricultural trade than for manufacturing trade. Hence, though the estimates be insignificant, they are consistent with the pattern of a currency union being used more extensively for trade in high-tariffed goods than in low-tariffed goods.

4 Results from a second level of disaggregation

As the results in tables 9 and 13 indicate a non-negligible currency union effect in the manufacturing industry, an effect not fully-explained by tariffs, this section of the paper investigates a further disaggregation but restricted to the manufacturing sector. Using the ISIC 3 classifications, I disaggregate manufactured products into two types. The first type consists of the 2-digit manufacturing codes, 15-19.[4] The second type consists of all other 2-digit manufacturing codes, 20-37.[5] The regressions in this section do not include Y_i^k, the sales of goods at destination prices from i in goods class k, as such variables are not sufficiently available for currency union countries. As the time-varying importer fixed effects control for E_j^k, the time-varying exporter fixed effects will control for Y_i^k.

Table 3 shows clear distinctions in the tariff rates for the two divisions of manufacturing products. Industries with codes 15-19, industries that process primary products, tend

[4] food products and beverages; tobacco products; textiles; wearing apparel; dressing and dyeing of fur; tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear

[5] wood and products of wood and cork, except furniture; articles of straw and plaiting materials; paper and paper products; publishing, printing and reproduction of recorded media; coke, refined petroleum products and nuclear fuel; chemicals and chemical products; rubber and plastics products; other non-metallic mineral products; basic metals; fabricated metal products, except machinery and equipment; machinery and equipment n.e.c.; office, accounting and computing machinery; electrical machinery and apparatus n.e.c.; radio, television and communication equipment and apparatus; medical, precision and optical instruments, watches and clocks; motor vehicles, trailers and semi-trailers; other transport equipment; furniture; manufacturing n.e.c.; recycling

Table 3: Average tariffs on manufacturing industries for currency unions, 1988-2011 (standard deviations in parentheses)

Currency Union	Industries 15-19	Industries 20-37
CEMAC	28.49	18.3
	(5.47)	(2.47)
ECCU	21.96	14.36
	(1.88)	(2.96)
India-Bhutan	42.25	27.2
	(15.53)	(18.61)
South Africa	19.48	9.95
	(2.84)	(4.36)
USA	12.13	7.4
	(2.14)	(3.2)
UEMOA	18.91	13.38
	(2.54)	(1.48)

to have higher tariffs than do more advanced industries classified with codes ranging from 20-37. This difference is consistent with Cline regarding higher tariffs for agricultural-related and low skilled-intensive manufacturing industries. These differences are persistent over time, as indicated by figures 11 through 15. Thus, manufacturing trade alone likely creates an aggregation bias regarding the effect of a common currency on trade. A further disaggregation will eliminate this bias.

Tables 14 through 21 report the results from estimating equation 1 for the classes of goods defined by ISIC 3 manufacturing codes 15-19 and 20-37. As was the case in the previous section, there exists a clear distinction between the effect of a common currency on trade for products with industry codes 15-19 and for products with industry codes 20-37, regardless of the estimation technique used. Unlike the case with OLS, the nature of the distinction is one of magnitude, not one of sign. For OLS, the effect of a common currency under the assumption of homogeneous integration is positive and significant. For PPML, the effect is negative and insignificant.

The results in tables 18 and 19 assume heterogeneous integration and indicate generally stronger currency union effects for products in codes 20-37. Exceptions include the Dollarized zone and India-Bhutan. Given that products with codes 15-19 are closely linked to agricultural production, it is not surprising to find stronger effects for trade in products coded 20-37, particularly for the Dollarized zone where the common currency predicted a significant, positive effect on intra-union, agricultural trade but a significant, negative effect on intra-union, manufacturing trade.

Controlling for tariffs in tables 20 and 21 reveals more heterogeneity among the types of manufactured goods and among currency unions. For goods with codes 15-19, the ECCU and Dollarized zones demonstrate a higher direct level of integration after controlling for tariffs as is evidenced by the currency union specific dummy variables. In contrast, the UEMOA, CEMAC, and India-Bhutan zones lose significance after controlling for tariffs. Tariff interactions with currency union membership are generally negative (except for the CEMAC) and significant (except for the CEMAC and India-Bhutan). Surprisingly, the log of tariff rates, without interaction, is positive and significant. I interpret this result to mean that goods with higher tariffs are traded more frequently than are goods with lower tariffs.

Comparing tables 19 and 21 shows that controlling for tariffs has a similar effect for trade in goods with codes 20-37 as does it for aggregate trade. In table 19, only the Dollarized zone and the Eurozone are not both positive and significant. Controlling for tariffs in table 21 leaves only one currency union, the UEMOA, with a positive and significant direct effect. Unlike the results for aggregate trade controlling for tariffs, the interactions between tariff rates and currency union membership are largely insignificant, except for the dollarized zone where the interaction is negative and significant. The point estimates for the currency union-tariff interactions are larger for trade in codes 15-19 than for trade in codes 20-37, similar to the pattern in the agricultural versus manufacturing comparison.

5 Textile trade

The trade data come from WITS/UNCTAD. Trade in textiles is defined by ISIC Division 32 (ISIC revision 2) or ISIC Division 17 (ISIC revision 3). When available, I use the ISIC revision 3 data with Harmonized System nomenclature. Otherwise, I use the ISIC revision 2 data with SITC nomenclature. To construct data on textile output, I use textile output as a share of value added in manufacturing and the current dollar measure of manufacturing value added from the World Bank's *World Development Indicators*.

Table 22 shows the results. The WAEMU, the CEMAC, and the Krone zone are associated with a large extent of intraunion textile trade. The Eurozone and the Benelux countries predict a significantly lower level of intraunion trade in textiles. The ECCU also predicts less intraunion trade in textiles, though the effect just misses the test for significance at the 10% level. Regional trade agreements and a common language predict a higher level of trade while shared colonial heritage predicts no effect (colonizer-colonized relationship) or a negative effect (the two variables capturing a country pair's shared history as colonies).

The results in table 22 generally resemble the results for the larger group of goods in the ISIC 3 15-19 group (see table 18). The ECCU is associated with a significant and positive effect for the broader category of trade though it is borderline negative and significant for textile trade. The Australian zone and India-Bhutan also have large and significant effects for ISIC 3 15-19 trade, though they are insignificant for textile trade. The World Supply of textiles matters more for trade than does World Supply for the broader category of trade. Though a regional trade agreement is significant for textile trade and for ISIC 3 15-19 trade, the effect is of a higher order of magnitude for the broader category than is it for textile trade. Colonial heritage tends to matter more for predicting more trade in the broader category than for textiles where the effect is negative or insignificant.

6 Conclusion

Theoretical and empirical literature supports the hypothesis that a group of countries sharing a common currency demonstrate higher degree of integration than does a group of otherwise similar countries lacking a common currency. Whitten (2012) shows that currency unions differ in the extent of integration by trade and that tariffs tend to be positively correlated with with the extent of integration.

This paper analyzes the results in Whitten (2012). Both tariffs and a common currency affect trade through their impact on the costs to trade. Anderson and Yotov (2010) note that trade costs have different impacts on the volume of trade. Consequently, understanding the interaction of two prominent trade costs requires a disaggregated trade analysis. In order to identify particular sectors a common currency enhances trade, this paper uses the sector-specific gravity equation developed by Anderson and Yotov (2010) to analyze bilateral trade flows in particular sectors. Trade within the Eurozone and the Dollarized countries tends to be in agricultural products. For other unions, intra-union trade tends to be in manufacturing products. Tariffs tend to facilitate agricultural trade for the ECCU and India-Bhutan while the same statement is true for manufacturing trade in the Rand zone, the Australian dollar zone, and India-Bhutan.

This finding is consistent with the finding in Whitten (2012) that tariffs play a key role in determining the extent of intra-union trade. As tariffs tend to differ across sectors, it is not surprising that intra-currency union agricultural trade differs from intra-currency union manufacturing trade. A common currency tends to predict more trade within manufacturing industries classified according to ISIC Revision 3 codes 20-37 than in industries classified with codes 15-19. Tariff rates for these industries with codes 15-19 tend to be higher than are tariff rates for industries with codes 20-37. After controlling for tariffs, the ECCU and the Dollarized countries display a significant, inherent extent of trade in industries coded 15-19 while only the UEMOA displays such effect for industries coded 20-37.

7 Appendix 1: Currency unions and their composition

East Caribbean Currency Union (ECCU)

Antigua and Barbuda
Barbados (1965-1972)
Dominica
St. Kitts and Nevis
St. Lucia
St. Vincent and the Grenadines

West African Economic and Monetary Union (UEMOA)

Benin
Burkina Faso
Côte d'Ivoire
Guinea-Bissau (1997-)
Mali
Mauritania (1960-1973)
Niger
Sénégal
Togo

Communauté Économique et Monétaire de l'Afrique Centrale (CEMAC)

Cameroon
Central African Republic
Chad
Congo, Rep.
Equatorial Guinea (1985-)
Gabon
Madagascar (1960-1972)

European Monetary Union (EMU) / Euroized

Austria (1999-)
Belgium (1999-)
Cyprus (2004-)
Estonia (2004-)
France (1999-)
Finland (1999-)

Germany (1999-)
Greece (2001-)
Ireland (1999-)
Italy (1999-)
Latvia (2005-)
Luxembourg (1999-)
Macedonia (2002-)
Malta (2005-)
Netherlands (1999-)
Portugal (1999-)
Slovak Republic (2006-)
Slovenia (2007-)
Spain (1999-)

Dollarized countries

American Samoa
The Bahamas (1973-)
Bermuda
Ecuador (2000-)
El Salvador (2001-)
Guam
Liberia
Marshall Islands
Federated States of Micronesia
Northern Mariana Islands
Palau
Panama
Puerto Rico
Virgin Islands (U.S.)

India

Bhutan
India

Denmark

Denmark
Færoe Islands
Greenland

Australia

Australia
Kiribati
Tonga (until 1990)

8 Appendix 2: Control variables and definitions

- CU_{ijt} is 1 if countries i and j belong to the same currency union in time t.
- $ECCU_{ijt}$ is 1 if countries i and j belong to the East Caribbean Currency Union in time t.
- $UEMOA_{ijt}$ is 1 if countries i and j belong to the *Union Economique et Monétaire Ouest Africaine* (West African Economic and Monetary Union) in time t.
- $CEMAC_{ijt}$ is 1 if countries i and j belong to the *Communauté Economique et Monétaire de l'Afrique Centrale* (Central African Economic and Monetary Coummnity) in time t.
- $AUSTRALIA_{ijt}$ is 1 if countries i and j both use the Australian dollar at time t.
- EMU_{ijt} is 1 if countries i and j both use the Euro at time t.
- $BHUTAN_{ijt}$ is 1 if i = India and j = Bhutan (or vice versa) at time t.
- $BRUNEI_{ijt}$ is 1 if if i = Singapore and j = Brunei (or vice versa) at time t.
- ln_dist_{ijt} is the log of Great Circle distance between countries i and j.
- $contig_{ijt}$ is 1 if countries i and j share a border.
- $comlang\_off_{ijt}$ is 1 if countries i and j share a common or official language.
- rta_{ijt} if 1 if countries i and j adhere to a trade agreement in time t.
- $colonizer\_variant_{ijt}$ is 1 if i maintains or has maintained some level of sovereignty over j up to time t, 0 otherwise. Sovereignty could be of an administrative nature, such as the US relationship with Guam, or complete sovereignty, such as France's control over Algeria before 1962.
- $comcol_{ijt}$ is 1 if countries i and j are both under the same, third-country colonizer in time t.
- $postcol_{ijt}$ is 1 if countries i and j were both under the same, third-country colonizer before time t but are now independent.
- $transcol_{ijt}$ is 1 if countries i and j were both under the same, third-country colonizer before time t but only 1 country has left the colonial relationship.

Figure 1: Average share of agricultural exports by currency union

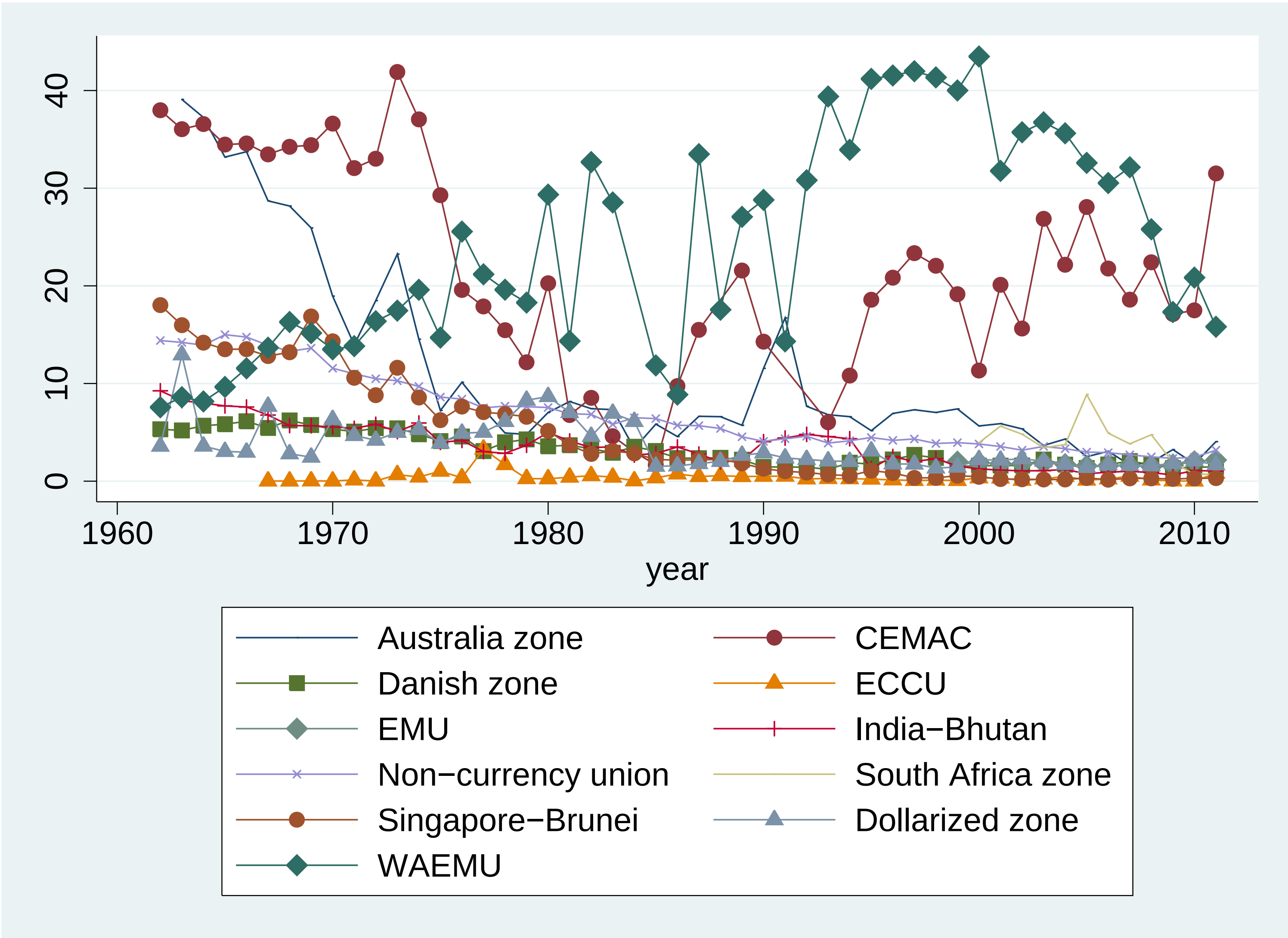


Figure 2: Average share of manufacturing exports by currency union

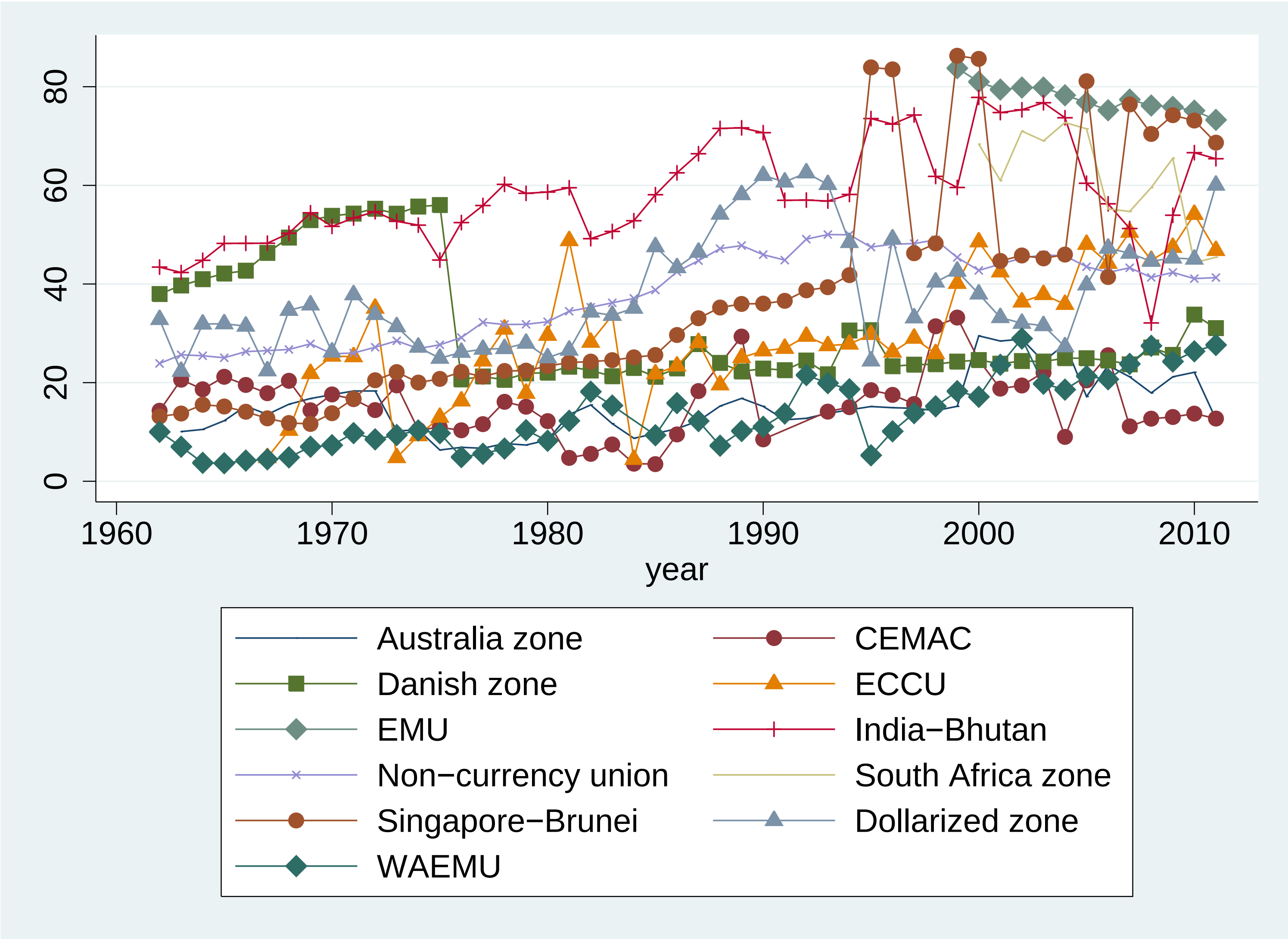


Figure 3: Average tariff rates across currency union countries for agricultural and manufacturing goods

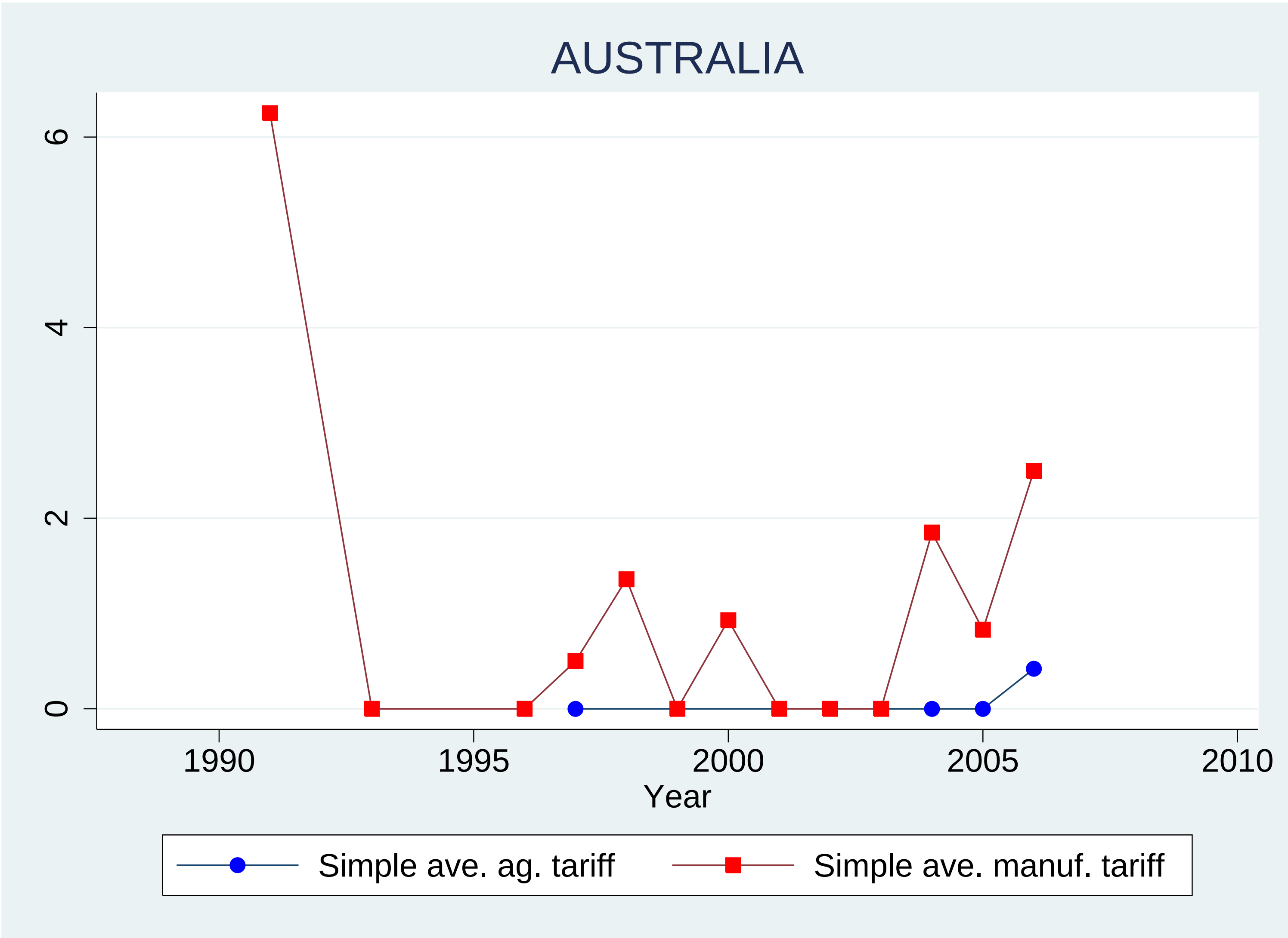


Figure 4: Average tariff rates across currency union countries for agricultural and manufacturing goods

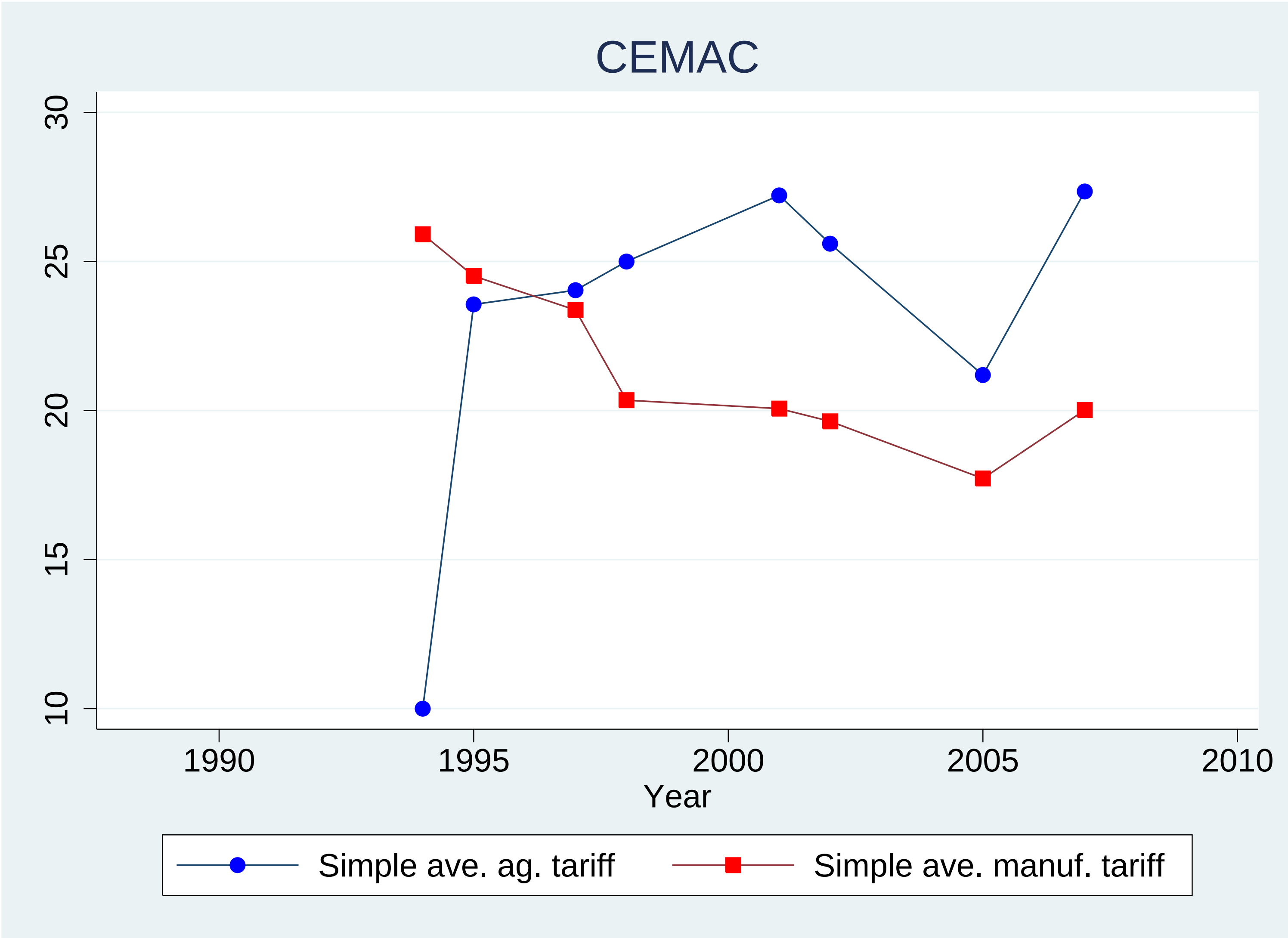


Figure 5: Average tariff rates across currency union countries for agricultural and manufacturing goods

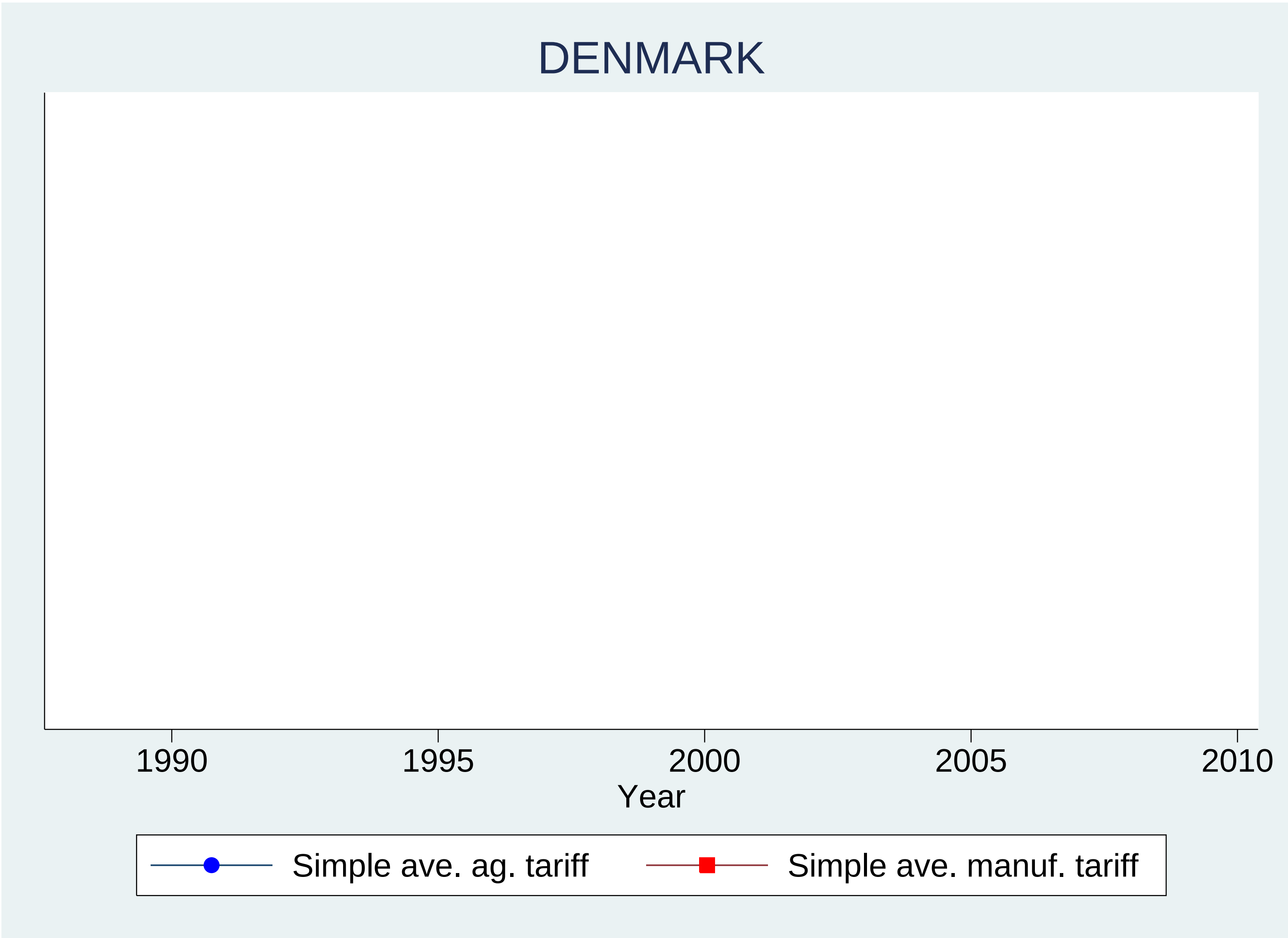


Figure 6: Average tariff rates across currency union countries for agricultural and manufacturing goods

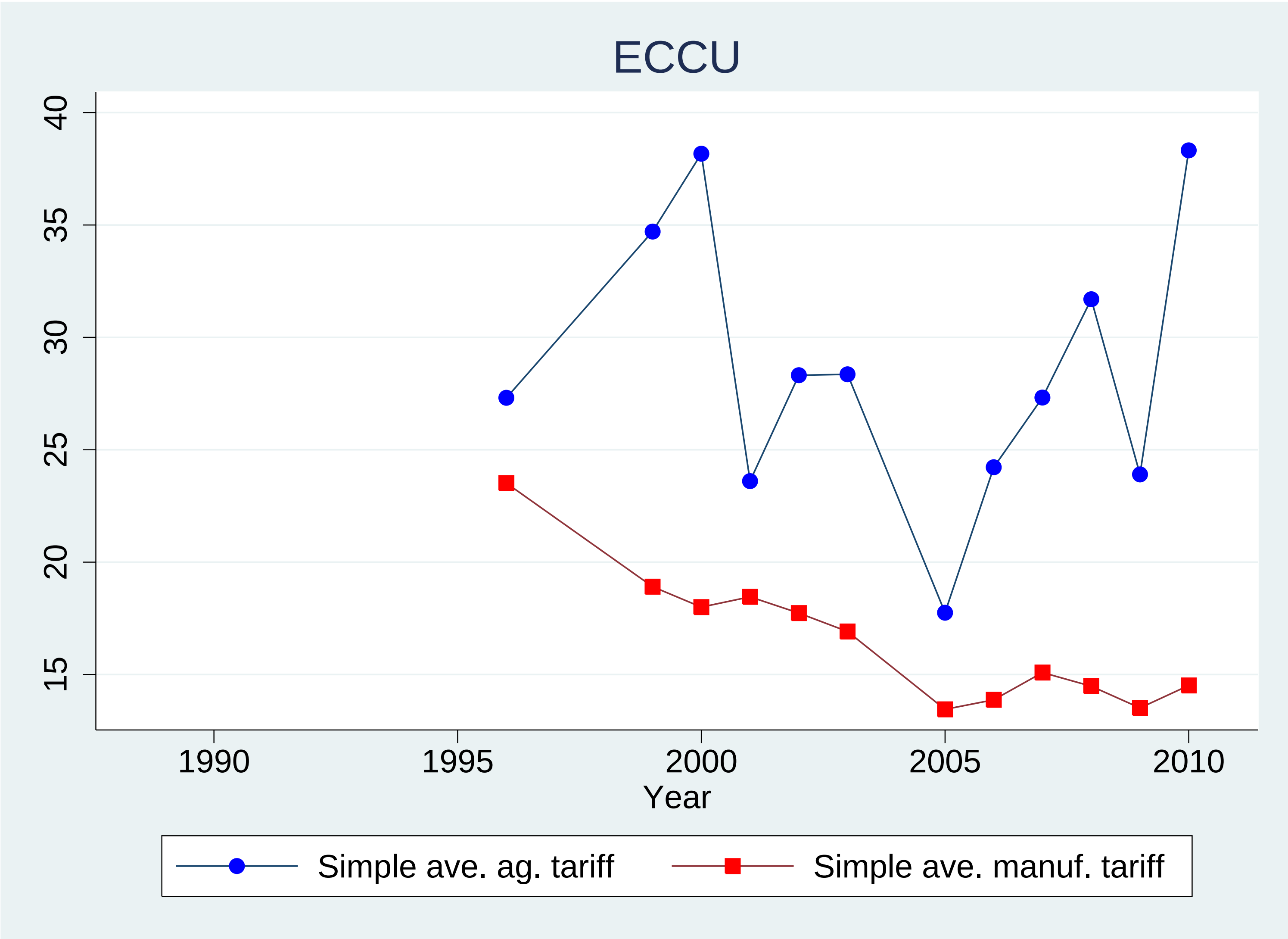


Figure 7: Average tariff rates across currency union countries for agricultural and manufacturing goods

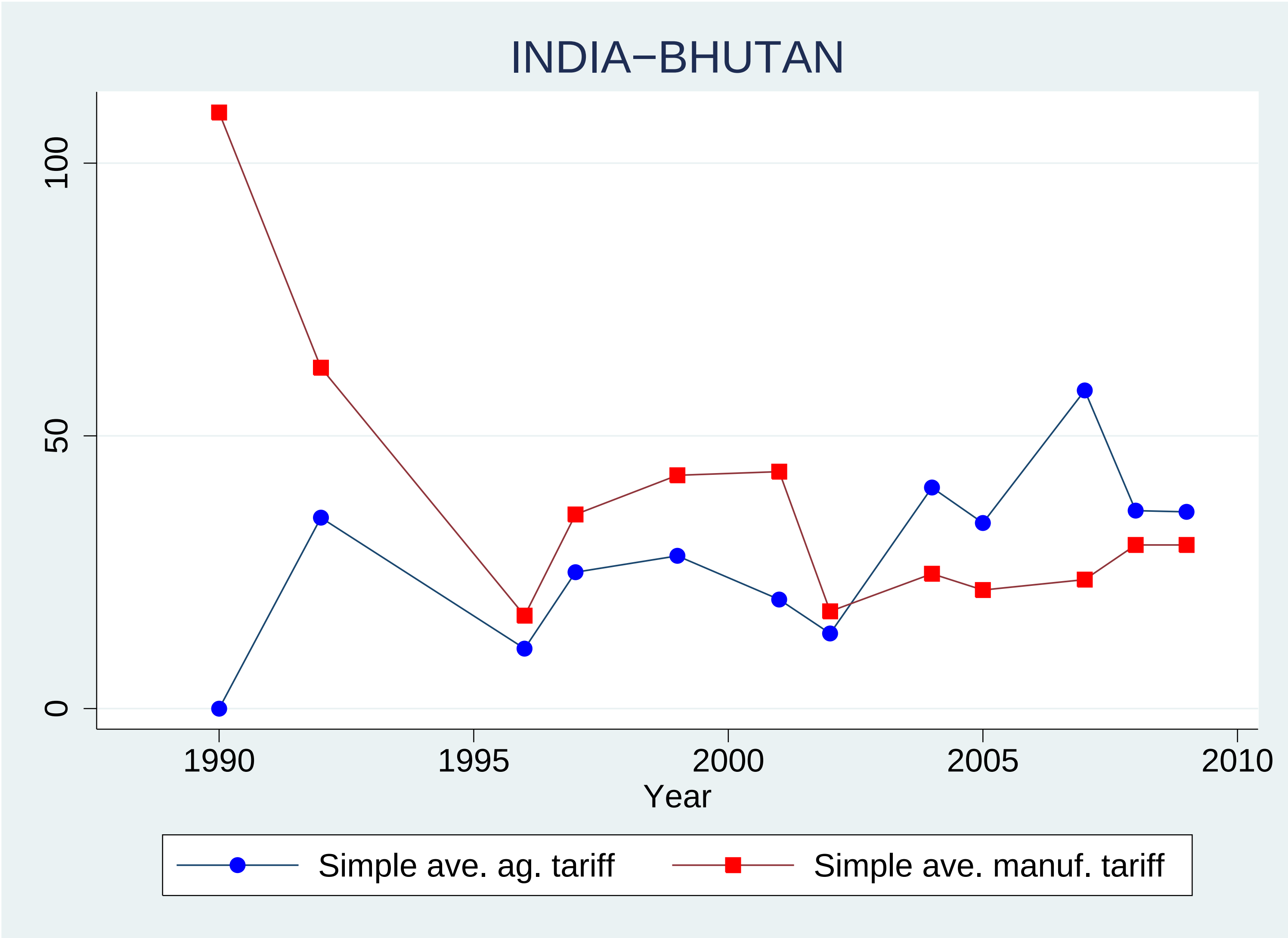


Figure 8: Average tariff rates across currency union countries for agricultural and manufacturing goods

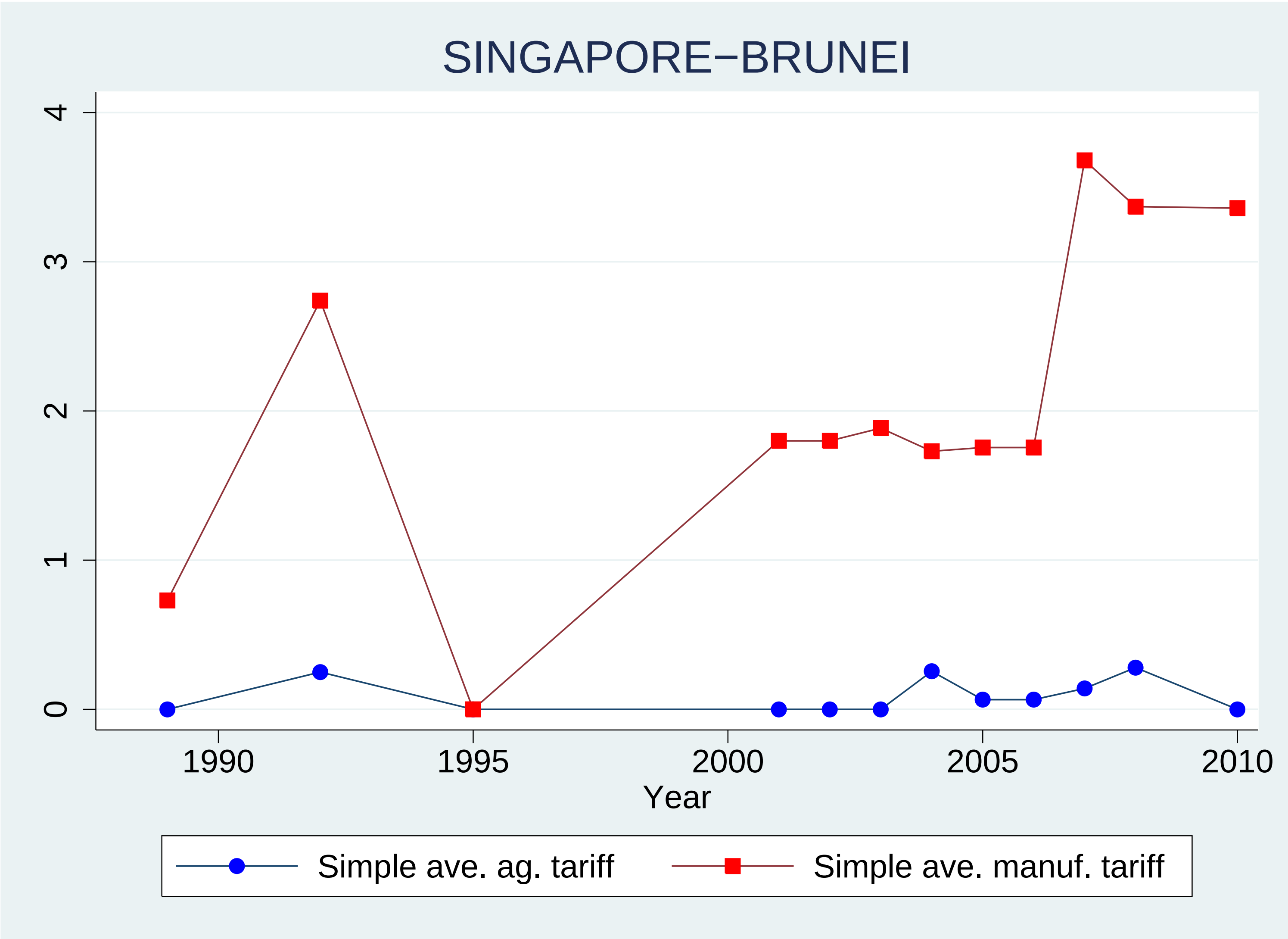


Figure 9: Average tariff rates across currency union countries for agricultural and manufacturing goods

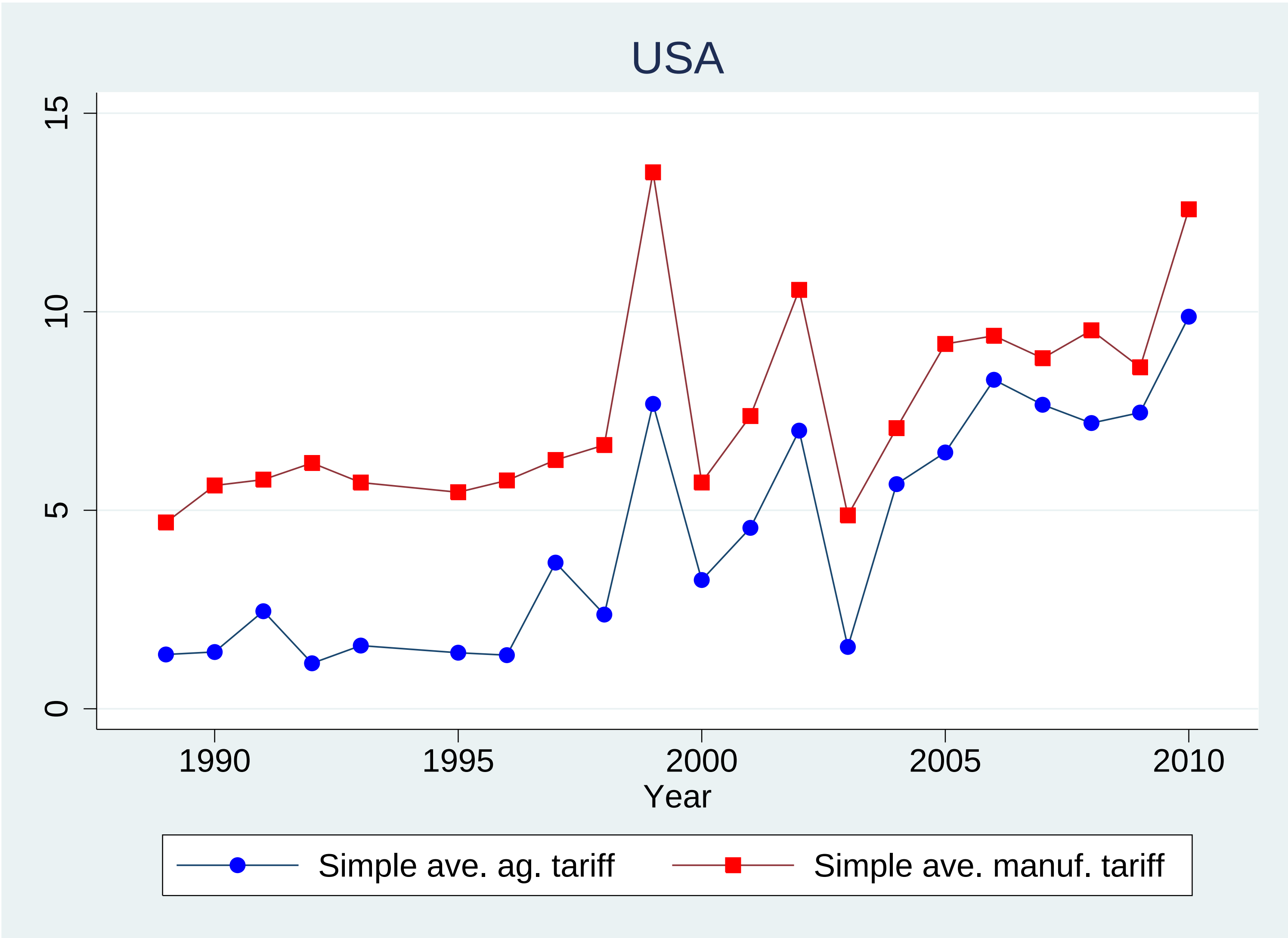


Figure 10: Average tariff rates across currency union countries for agricultural and manufacturing goods

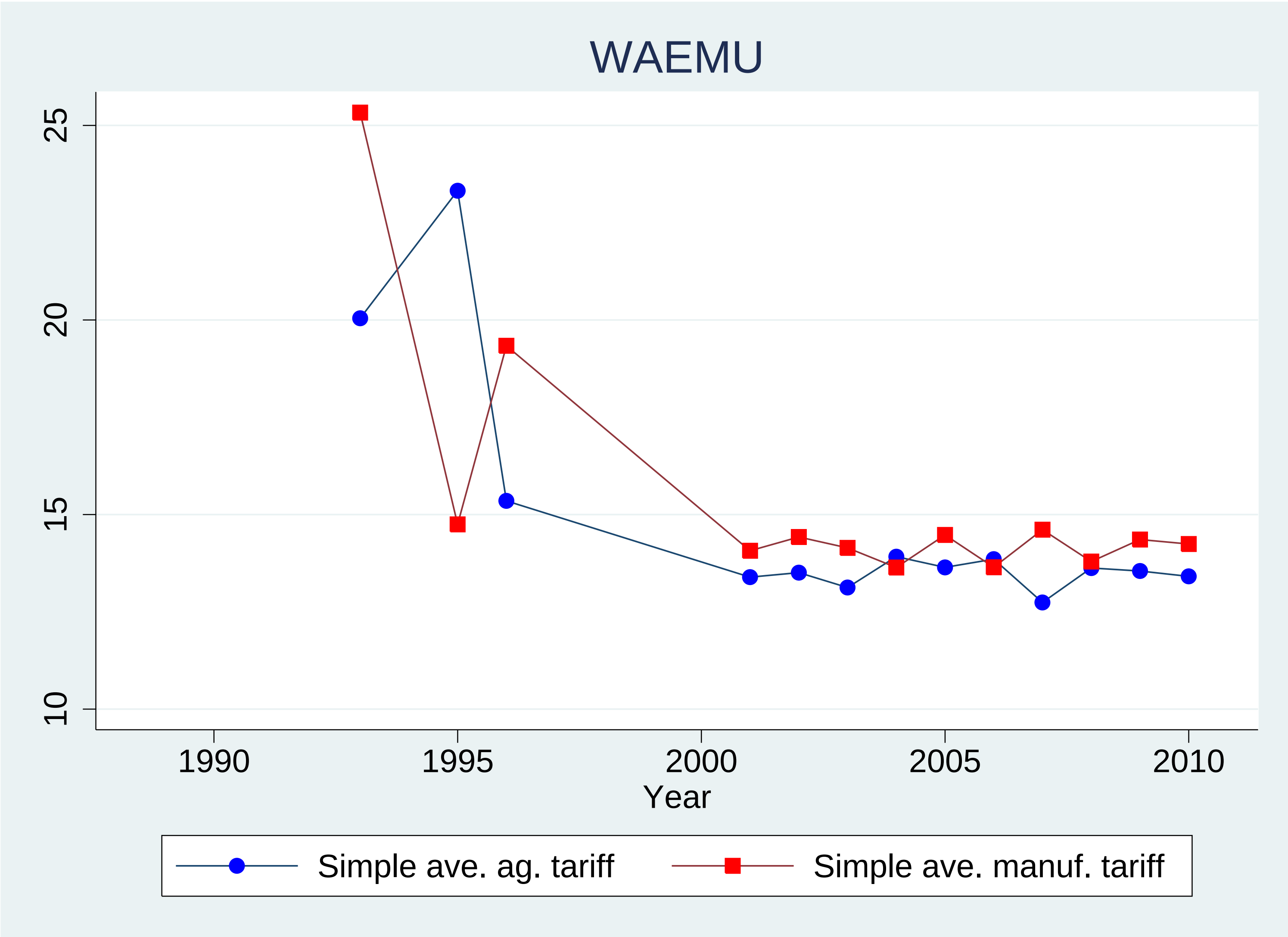


Figure 11: Average tariff rates across currency union countries for disaggregated manufacturing goods

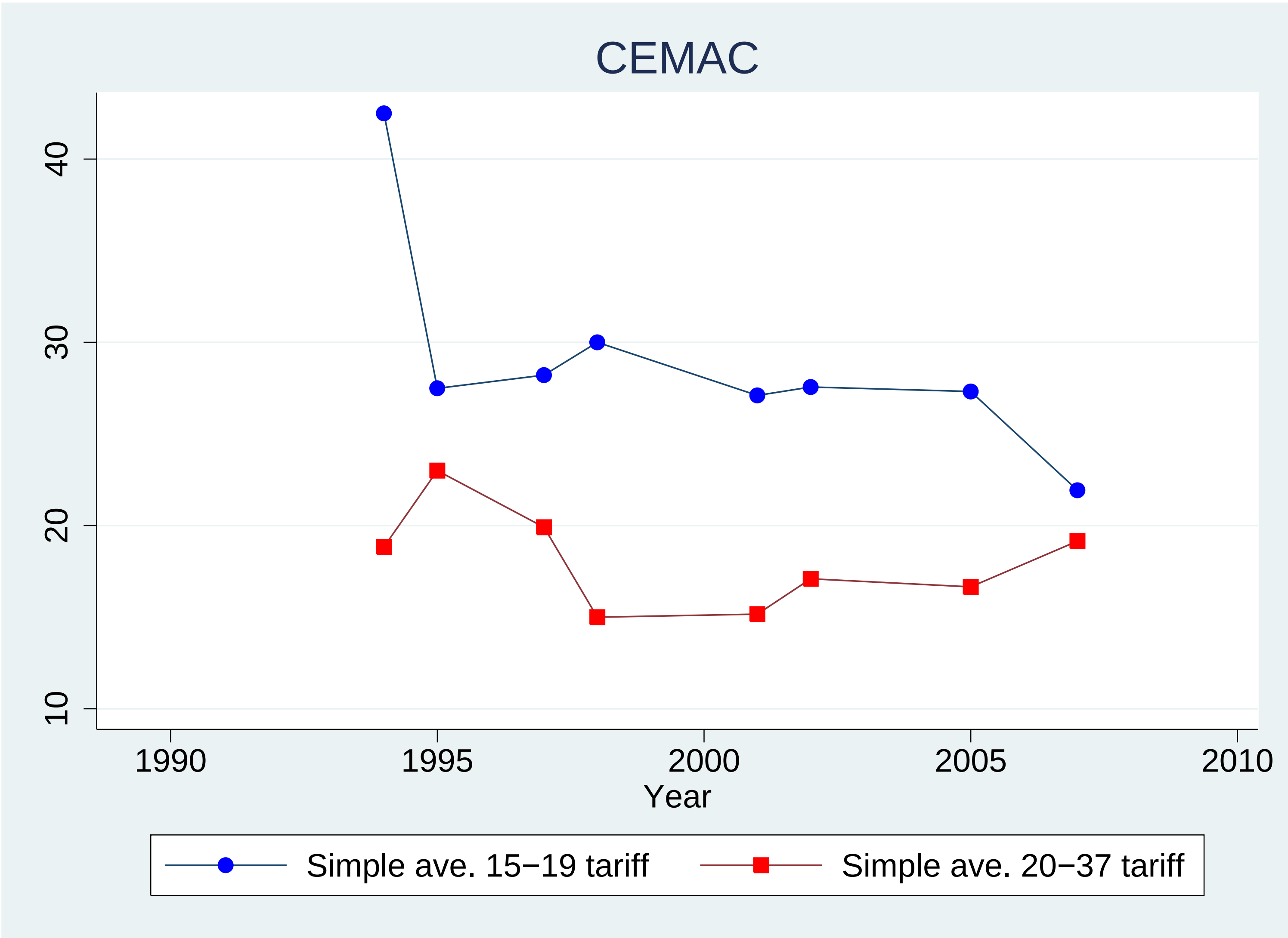


Figure 12: Average tariff rates across currency union countries for disaggregated manufacturing goods

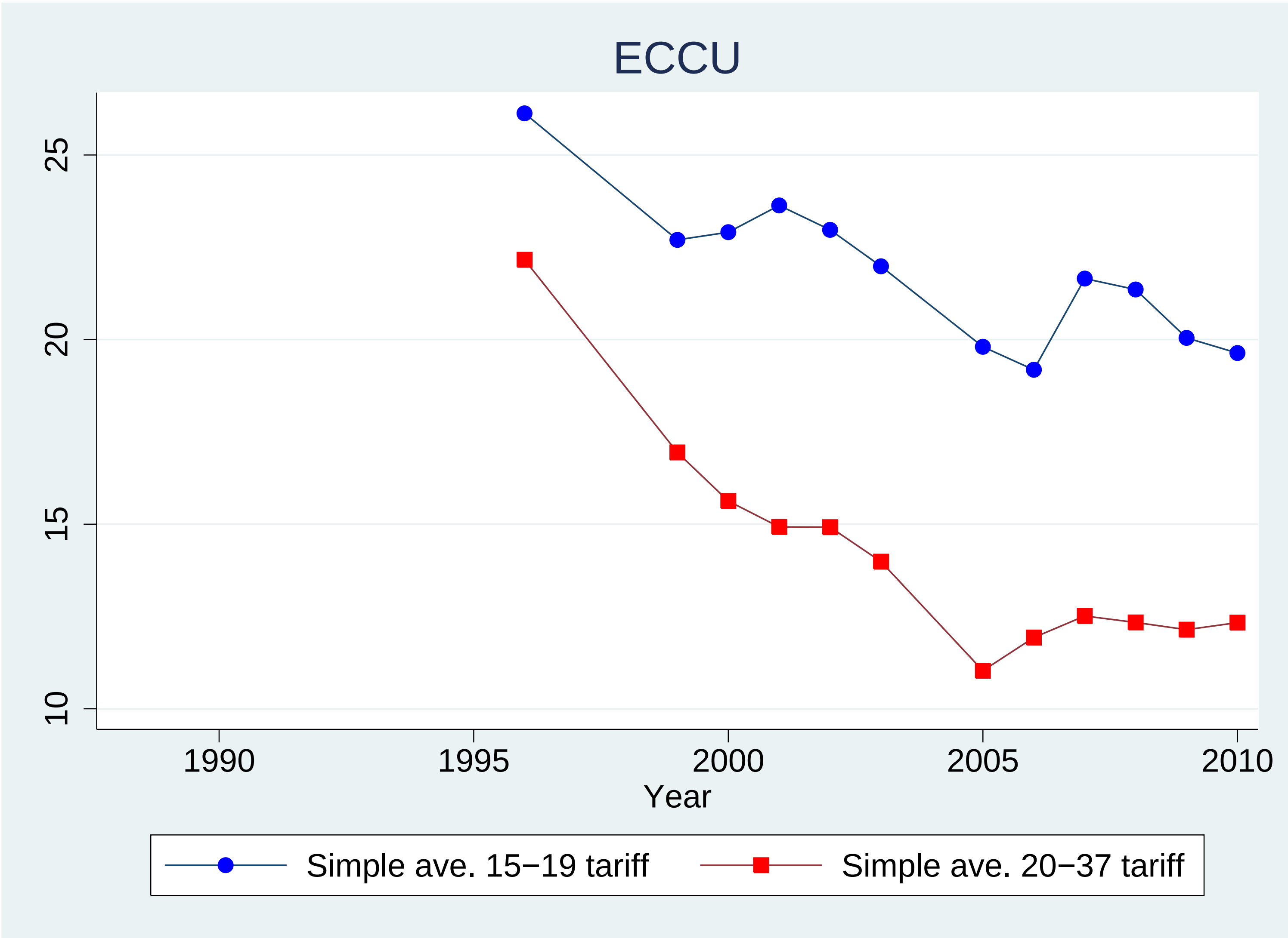


Figure 13: Average tariff rates across currency union countries for disaggregated manufacturing goods

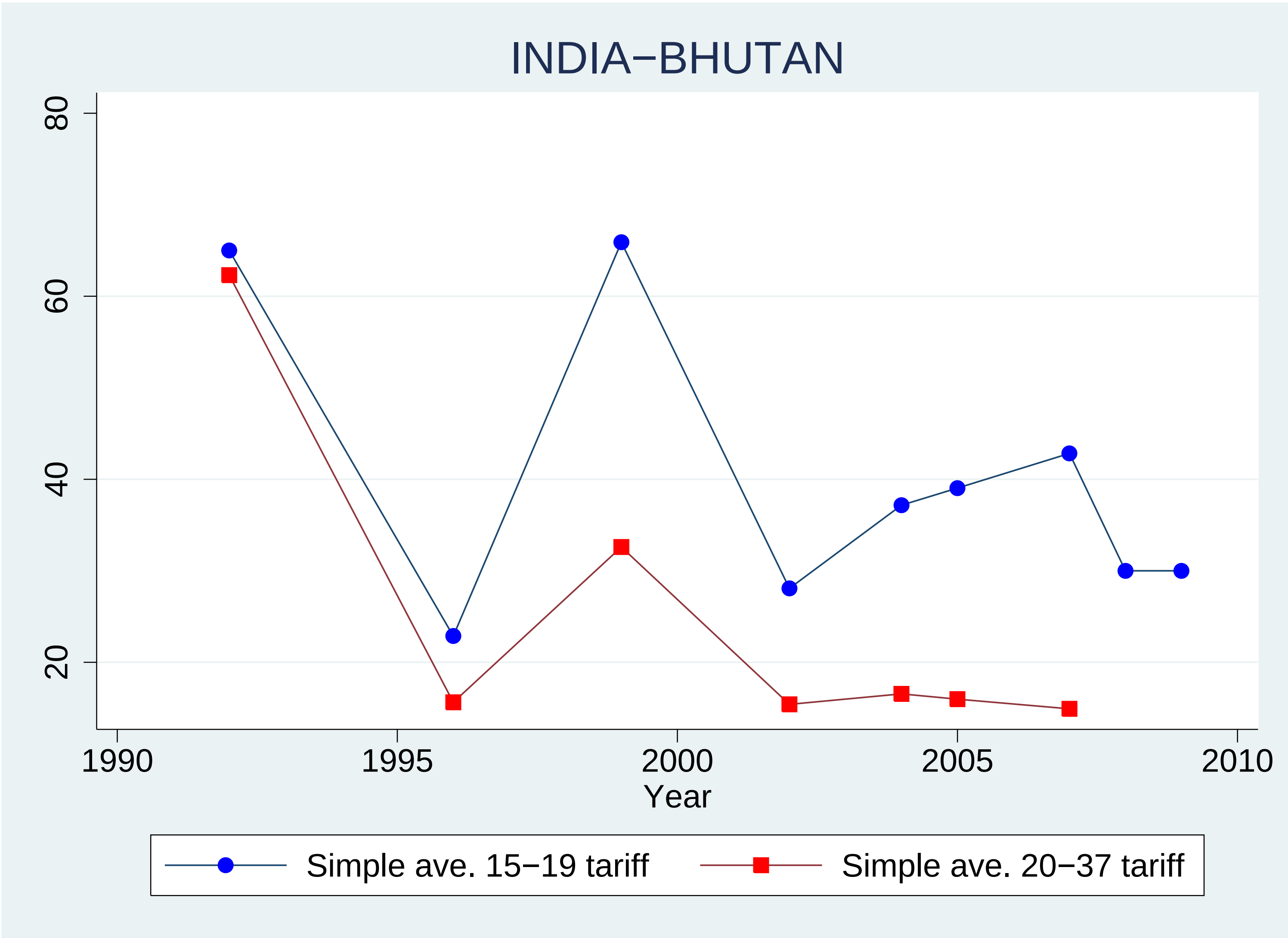


Figure 14: Average tariff rates across currency union countries for disaggregated manufacturing goods

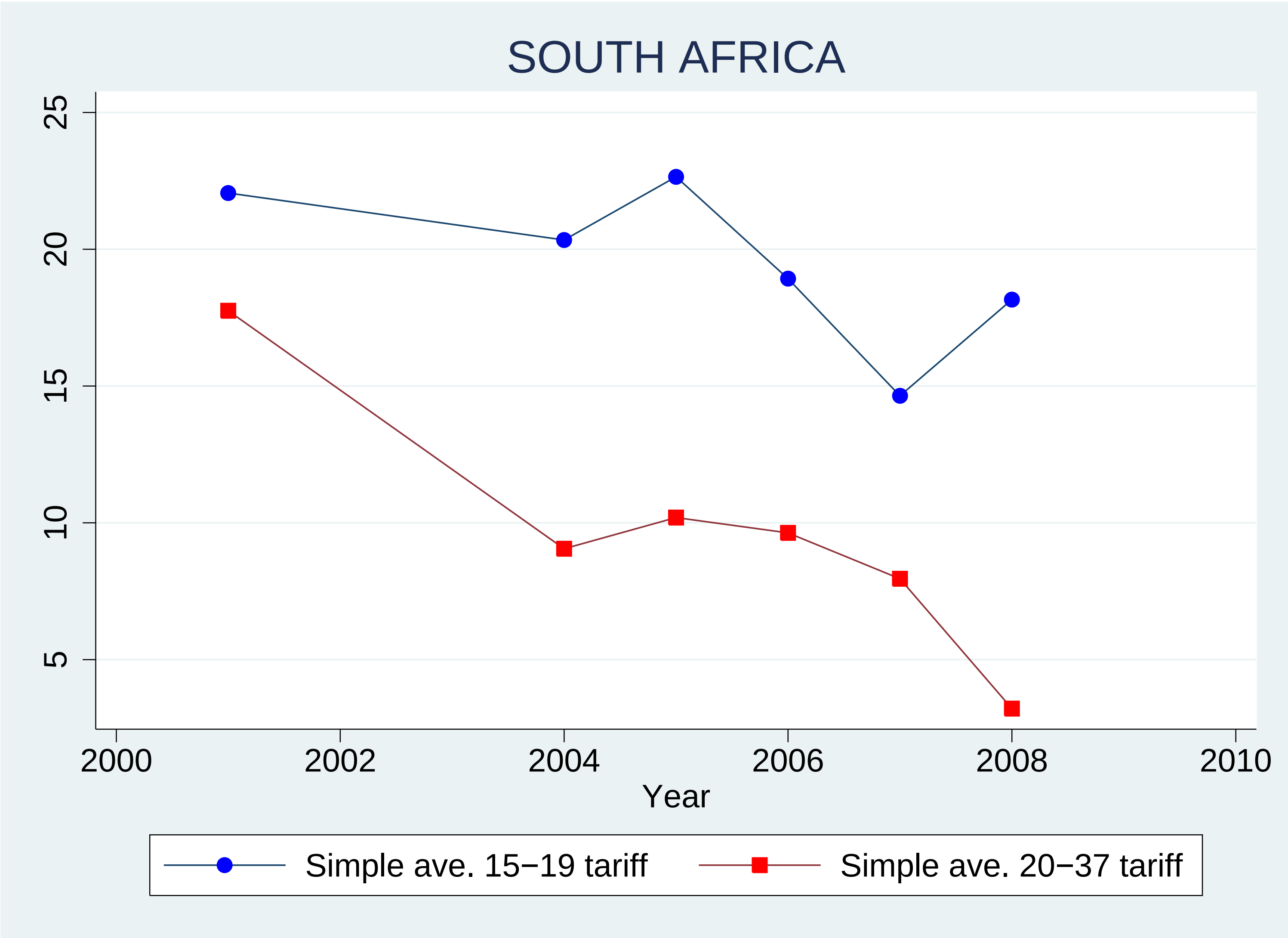
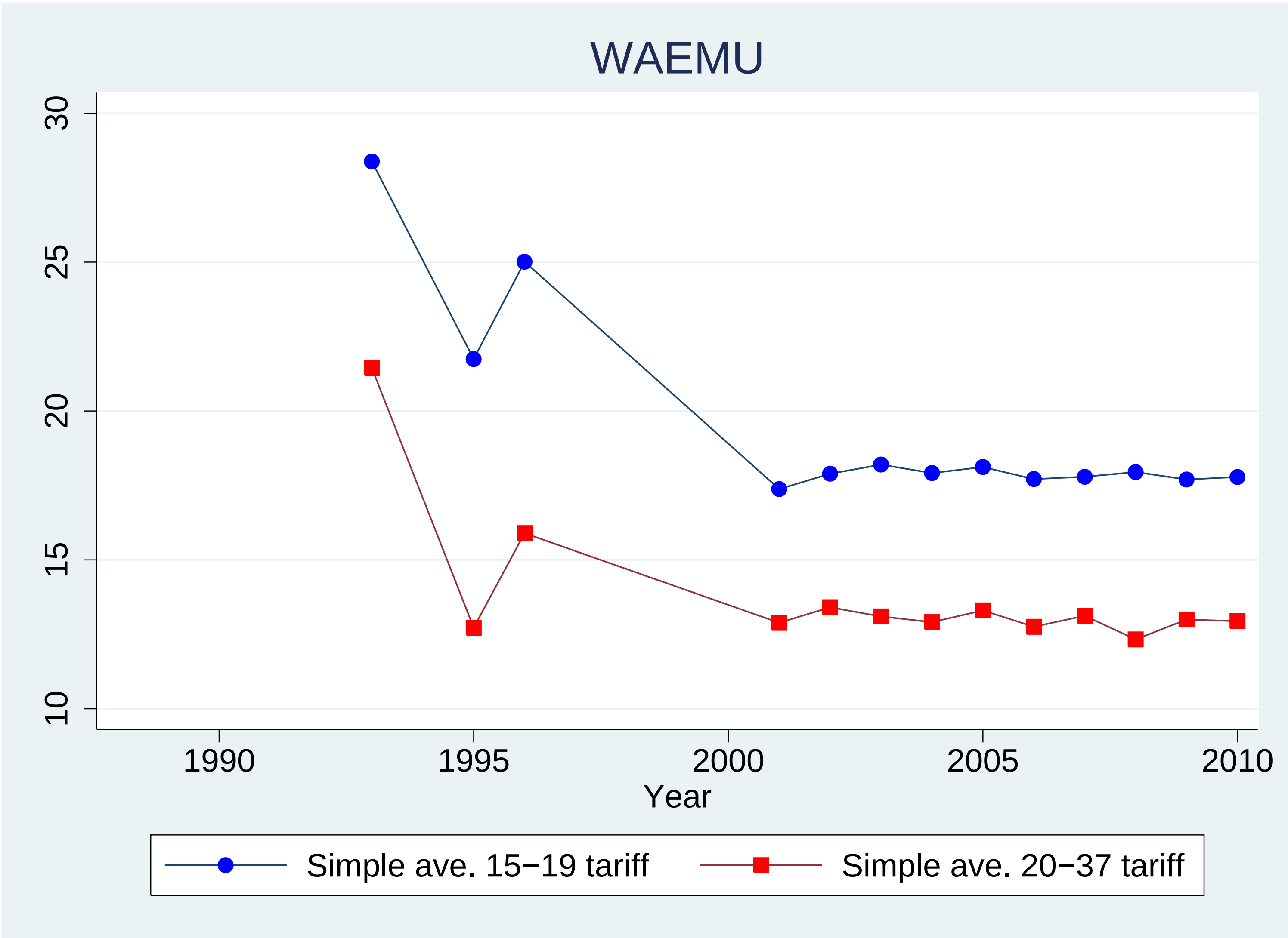


Figure 15: Average tariff rates across currency union countries for disaggregated manufacturing goods



9 Appendix: Tables

Table 4: Estimation results : Baseline model, heterogeneous common currency effects, 1950-2008
Dependent variable is the level of exports.

Variable	**PPML**	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	3.945**	(0.000)
West African Economic and Monetary Union	3.285**	(0.000)
Central African Economic and Monetary Union	0.069	(0.911)
Australia zone	1.655**	(0.001)
Dollarized zone	-0.509	(0.183)
Euro zone	0.095	(0.454)
Danish zone	8.013**	(0.000)
India-Bhutan	4.214**	(0.000)
Singapore-Brunei	1.35*	(0.014)
$\ln(Y_{it} \times Y_{jt})$	0.892**	(0.000)
$\ln Y_t^W$	0.068	(0.411)
Pair belongs to a Regional Trade Accord	0.545**	(0.000)
Countries are contiguous	0.793**	(0.001)
Colonizer-colonized relationship	0.763**	(0.001)
Countries are colonies of same country	-1.511*	(0.047)
Country pair transitioning from colonialism	-0.612†	(0.081)
Countries were colonies of same country	0.332*	(0.041)
Shared common or official language	0.364*	(0.011)
Number of observations	346254	
Number of pairs	14912	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 5: Estimation results : Tariffs (interacted) and TFP, Relative heterogeneous effects, 1988-2008.

Variable	PPML	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	-2.798	(0.48)
West African Economic & Monetary Union	8.385**	(0.000)
Central African Economic & Monetary Union	-8.936**	(0.000)
Dollar zone	-2.211**	(0.000)
India-Bhutan	7.453**	(0.000)
Singapore-Brunei	1.418*	(0.01)
ECCU $\times \ln \text{tariffs}_{ijt}$	2.377*	(0.04)
UEMOA $\times \ln \text{tariffs}_{ijt}$	-1.726†	(0.05)
CEMAC $\times \ln \text{tariffs}_{ijt}$	2.765*	(0.01)
Dollar zone $\times \ln \text{tariffs}_{ijt}$	0.994**	(0.000)
India-Bhutan $\times \ln \text{tariffs}_{ijt}$	-0.69**	(0.000)
Singapore-Brunei $\times \ln \text{tariffs}_{ijt}$	0.079	(0.62)
$\ln \text{tariffs}_{ijt}$	-0.099*	(0.01)
$\ln \sigma_{tariffs}$	0.201**	(0.000)
$\ln (Y_{it} \times Y_{jt})$	0.669**	(0.000)
$\ln Y_t^W$	0.447*	(0.01)
Pair belongs to a Regional Trade Accord	0.355**	(0.000)
$\ln (TFP_{it} \times TFP_{jt})$	1.312**	(0.000)
Countries are contiguous	1.634**	(0.000)
Colonizer-colonized relationship	0.253	(0.52)
Country pair transitioning from colonialism	-0.483	(0.33)
Countries were colonies of same country	0.405*	(0.04)
Shared common or official language	0.26	(0.11)
Number of observations	69609	
Number of pairs	9876	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.
Dependent variable is the level of exports.

Table 6: Estimation results: Agricultural trade, 1976-2010
Dependent variable is the level of exports.

Variable	PPML	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
Countries share a common currency	0.313	(0.001)**
$\ln Y_{it}^{ag}$	0.41	(0.000)**
$\ln Y_{world,t}^{ag}$	0.554	(0.000)**
Pair belongs to a Regional Trade Accord	0.575	(0.000)**
Colonizer-colonized relationship	0.605	(0.000)**
Countries are colonies of same country	1.118	(0.345)
Country pair transitioning from colonialism	-0.983	(0.009)**
Countries were colonies of same country	0.289	(0.016)*
Countries are contiguous	0.546	(0.000)**
Shared common or official language	-0.002	(0.982)
Number of observations	307064	
Number of pairs	24472	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 7: Estimation results : Manufacturing trade, 1980-2010
Dependent variable is the level of exports.

Variable	PPML	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
Countries share a common currency	-0.145	(0.085)†
$\ln Y_{it}^{manuf}$	0.8	(0.000)**
$\ln Y_{world,t}^{manuf}$	0.917	(0.000)**
Pair belongs to a Regional Trade Accord	0.833	(0.000)**
Colonizer-colonized relationship	0.161	(0.347)
Countries are colonies of same country	-0.085	(0.941)
Country pair transitioning from colonialism	-0.361	(0.189)
Countries were colonies of same country	0.441	(0.000)**
Countries are contiguous	0.599	(0.000)**
Shared common or official language	0.41	(0.000)**
Number of observations	277684	
Number of pairs	24356	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 8: Estimation results : Agricultural trade, 1976-2010
Dependent variable is the level of exports.

Variable	PPML	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	-0.32	(0.767)
West African Economic & Monetary Union	1.154*	(0.025)
Central African Economic & Monetary Union	-0.893	(0.245)
Rand zone (South Africa)	2.281*	(0.028)
Australia zone	-0.505	(0.318)
Dollarized zone	0.621*	(0.012)
Eurozone	0.332**	(0.000)
Krone zone (denmark)	3.581**	(0.000)
India-Bhutan	2.517**	(0.007)
Benelux	-1.809**	(0.000)
$\ln Y_{it}^{ag}$	0.4**	(0.000)
$\ln Y_{world,t}^{ag}$	0.536**	(0.000)
Pair belongs to a regional trade agreement	0.541**	(0.000)
Colonizer-colonized relationship	0.81**	(0.000)
Countries are colonies of same country	1.109	(0.341)
Country pair transitioning from colonialism	-0.96**	(0.009)
Countries were colonies of same country	0.285*	(0.017)
Countries are contiguous	0.548**	(0.000)
Pair share a common language	-0.005	(0.963)
Number of observations	307064	
Number of pairs	24472	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 9: Estimation results : Manufacturing trade, 1980-2010
Dependent variable is the level of exports.

Variable	**PPML**	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	4.485**	(0.000)
West African Economic & Monetary Union	3.022**	(0.000)
Central African Economic & Monetary Union	3.082**	(0.000)
Rand zone (South Africa)	1.742**	(0.004)
Australia zone	3.288**	(0.000)
Dollarized zone	-1.534**	(0.001)
Eurozone	-0.004	(0.959)
Krone zone (denmark)	6.45**	(0.000)
India-Bhutan	4.201**	(0.000)
Benelux	-0.691*	(0.024)
$\ln Y_{it}^{manuf}$	0.832**	(0.000)
$\ln Y_{world,t}^{manuf}$	1.0**	(0.000)
Pair belongs to a regional trade agreement	0.822**	(0.000)
Colonizer-colonized relationship	0.242	(0.229)
Countries are colonies of same country	-0.555	(0.6)
Country pair transitioning from colonialism	-0.306	(0.258)
Countries were colonies of same country	0.465**	(0.000)
Countries are contiguous	0.619**	(0.000)
Pair share a common language	0.333**	(0.000)
Number of observations	277684	
Number of pairs	24356	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 10: Estimation results: Agricultural trade, 1976-2010
Dependent variable is the log of exports.

Variable	OLS	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
Countries share a common currency	-0.012	(0.909)
$\ln Y_{it}^{ag}$	0.287	$(0.000)^{**}$
$\ln Y_{world,t}^{ag}$	0.093	$(0.069)^{\dagger}$
Pair belongs to a Regional Trade Accord	0.299	$(0.000)^{**}$
Colonizer-colonized relationship	1.2	$(0.000)^{**}$
Countries are colonies of same country	2.054	$(0.014)^{*}$
Country pair transitioning from colonialism	0.395	$(0.044)^{*}$
Countries were colonies of same country	0.266	$(0.000)^{**}$
Countries are contiguous	0.77	$(0.000)^{**}$
Shared common or official language	0.329	$(0.000)^{**}$
Number of observations	186103	
R^2	0.5965	
Number of pairs	17079	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 11: Estimation results: Manufacturing trade, 1980-2010
Dependent variable is the log of exports.

Variable	OLS $-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
Countries share a common currency	0.472	(0.000)**
$\ln Y_{it}^{manuf}$	0.207	(0.000)**
$\ln Y_{world,t}^{manuf}$	0.65	(0.000)**
Pair belongs to a Regional Trade Accord	0.24	(0.000)**
Colonizer-colonized relationship	0.737	(0.000)**
Countries are colonies of same country	1.107	(0.012)*
Country pair transitioning from colonialism	0.162	(0.113)
Countries were colonies of same country	0.387	(0.000)**
Countries are contiguous	0.379	(0.000)**
Shared common or official language	0.344	(0.000)**

Number of observations	256644	
R^2	0.7407	
Number of pairs	23022	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 12: Estimation results : Agricultural trade with tariffs, 1988-2010
Dependent variable is the level of exports.

Variable	PPML	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	-3.959	(0.119)
West African Economic & Monetary Union	1.329	(0.262)
Central African Economic & Monetary Union	-32.179	(0.278)
Rand zone (South Africa)	-1.212†	(0.098)
Dollarized zone	0.487	(0.158)
India-Bhutan	-2.937	(0.148)
Log of tariffs on agricultural goods	-0.122**	(0.000)
ECCU $\times \ln \text{tariffs}_{ijt}$	1.937**	(0.004)
UEMOA $\times \ln \text{tariffs}_{ijt}$	-0.186	(0.685)
CEMAC $\times \ln \text{tariffs}_{ijt}$	9.337	(0.285)
USA $\times \ln \text{tariffs}_{ijt}$	0.076	(0.609)
India-Bhutan $\times \ln \text{tariffs}_{ijt}$	1.909**	(0.004)
$\ln Y_{it}^{ag}$	0.272**	(0.000)
$\ln Y_{world,t}^{ag}$	0.719**	(0.000)
Pair belongs to a regional trade agreement	0.169	(0.161)
Colonizer Variant	0.951**	(0.000)
Transitional colonial relationship	-1.216**	(0.000)
Former subjects of a colonial empire	0.435**	(0.000)
Countries are contiguous	0.14	(0.286)
Pair share a common language	-0.305*	(0.024)
$\ln \sigma_{tariff}$	0.196**	(0.000)
Number of observations	31308	
Number of pairs	6646	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 13: Estimation results : Manufacturing trade with tariffs, 1988-2010
Dependent variable is the level of exports.

Variable	**PPML**	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	4.024**	(0.008)
West African Economic & Monetary Union	4.562	(0.105)
Central African Economic & Monetary Union	8.167*	(0.034)
Rand zone (South Africa)	-0.822	(0.15)
Australia zone	5.551**	(0.000)
Dollarized zone	0.73	(0.33)
India-Bhutan	-2.929*	(0.036)
Log of tariffs on manufactured goods	-0.03	(0.582)
ECCU $\times \ln \text{tariffs}_{ijt}$	0.106	(0.814)
UEMOA $\times \ln \text{tariffs}_{ijt}$	-0.523	(0.653)
CEMAC $\times \ln \text{tariffs}_{ijt}$	-1.52	(0.216)
South Africa $\times \ln \text{tariffs}_{ijt}$	0.729**	(0.000)
Australia $\times \ln \text{tariffs}_{ijt}$	2.197**	(0.000)
USA $\times \ln \text{tariffs}_{ijt}$	-0.832*	(0.023)
India-Bhutan $\times \ln \text{tariffs}_{ijt}$	2.61**	(0.000)
$\ln Y_{it}^{manuf}$	0.772**	(0.000)
$\ln Y_{world,t}^{manuf}$	0.911**	(0.000)
Pair belongs to a regional trade agreement	0.946**	(0.000)
Colonizer Variant	-0.13	(0.664)
Transitional colonial relationship	-1.845*	(0.011)
Former subjects of a colonial empire	0.562**	(0.000)
Countries are contiguous	0.87**	(0.000)
Pair share a common language	0.302**	(0.000)
$\ln \sigma_{tariff}$	0.121*	(0.01)

Number of observations	64799
Number of pairs	13362

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 14: Estimation results : ISIC 15-19 trade, 1977-2010
Dependent variable is the log of exports.

Variable	OLS	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
Countries share a common currency	0.388	(0.000)**
$\ln Y^{15-19}_{world,t}$	0.047	(0.000)**
Countries are contiguous	0.39	(0.000)**
Shared common or official language	0.391	(0.000)**
Pair belongs to a Regional Trade Accord	0.299	(0.000)**
Colonizer-colonized relationship	0.925	(0.000)**
Countries are colonies of same country	0.819	(0.074)†
Country pair transitioning from colonialism	0.312	(0.001)**
Countries were colonies of same country	0.453	(0.000)**
Number of observations	190027	
R^2	0.7	
Number of pairs	17166	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 15: Estimation results : ISIC 15-19 trade, 1977-2010
Dependent variable is the level of exports.

Variable	**PPML**	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
Countries share a common currency	-0.038	(0.582)
$\ln Y^{15-19}_{world,t}$	0.075	$(0.009)^{**}$
Countries are contiguous	0.662	$(0.000)^{**}$
Shared common or official language	0.667	$(0.000)^{**}$
Pair belongs to a Regional Trade Accord	1.021	$(0.000)^{**}$
Colonizer-colonized relationship	0.697	$(0.000)^{**}$
Countries are colonies of same country	-1.391	$(0.086)^{\dagger}$
Country pair transitioning from colonialism	-1.107	$(0.001)^{**}$
Countries were colonies of same country	0.406	$(0.009)^{**}$
Number of observations	192017	
Number of pairs	17413	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 16: Estimation results : ISIC 20-37 trade, 1966-2010
Dependent variable is the log of exports.

Variable	**OLS**	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
Countries share a common currency	0.521	(0.000)**
$\ln Y^{20-37}_{world,t}$	0.237	(0.000)**
Countries are contiguous	0.277	(0.000)**
Shared common or official language	0.358	(0.000)**
Pair belongs to a Regional Trade Accord	0.192	(0.000)**
Colonizer-colonized relationship	0.745	(0.000)**
Countries are colonies of same country	0.483	(0.063)†
Country pair transitioning from colonialism	0.157	(0.073)†
Countries were colonies of same country	0.381	(0.000)**
Number of observations	210898	
R^2	0.758	
Number of pairs	18759	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 17: Estimation results : ISIC 20-37 trade, 1966-2010
Dependent variable is the level of exports.

Variable	**PPML**	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
Countries share a common currency	-0.1	(0.192)
$\ln Y^{15-19}_{world,t}$	0.523	(0.000)**
Countries are contiguous	0.644	(0.000)**
Shared common or official language	0.418	(0.000)**
Pair belongs to a Regional Trade Accord	0.878	(0.000)**
Colonizer-colonized relationship	0.209	(0.000)
Countries are colonies of same country	-1.645	(0.000)**
Country pair transitioning from colonialism	-0.125	(0.626)
Countries were colonies of same country	0.32	(0.024)*
Number of observations	213661	
Number of pairs	19123	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 18: Estimation results : ISIC 15-19 trade, 1977-2010
Dependent variable is the level of exports.

Variable	PPML	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	3.135**	(0.000)
West African Economic & Monetary Union	1.266*	(0.018)
Central African Economic & Monetary Union	2.913**	(0.001)
Australia zone	2.273*	(0.012)
Dollarized zone	0.632†	(0.089)
Eurozone	-0.056	(0.422)
Krone zone (denmark)	5.618**	(0.000)
India-Bhutan	4.986**	(0.000)
Benelux	-1.204**	(0.000)
$\ln Y^{15-19}_{world,t}$	0.075**	(0.009)
Countries are contiguous	0.666**	(0.000)
Pair share a common language	0.664**	(0.000)
Pair belongs to a regional trade agreement	1.016**	(0.000)
Colonizer Variant	0.772**	(0.000)
Common colonizer	-1.289	(0.14)
Transitional colonial relationship	-1.095**	(0.001)
Former subjects of a colonial empire	0.413**	(0.008)
Number of observations	192017	
Number of pairs	17413	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 19: Estimation results : ISIC 20-37 trade, 1966-2010
Dependent variable is the level of exports.

Variable	PPML	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	5.101**	(0.000)
West African Economic & Monetary Union	3.766**	(0.000)
Central African Economic & Monetary Union	3.218**	(0.000)
Australia zone	2.368**	(0.000)
Dollarized zone	-2.064**	(0.000)
Eurozone	-0.04	(0.635)
Krone zone (denmark)	6.732**	(0.000)
India-Bhutan	4.101**	(0.000)
Benelux	-0.578†	(0.083)
$\ln Y_{world,t}^{20-37}$	0.695**	(0.000)
Countries are contiguous	0.623**	(0.000)
Pair share a common language	0.405**	(0.000)
Pair belongs to a regional trade agreement	0.835**	(0.000)
Colonizer Variant	0.226	(0.274)
Common colonizer	-1.864**	(0.000)
Transitional colonial relationship	-0.148	(0.553)
Former subjects of a colonial empire	0.302*	(0.032)
Number of observations	213661	
Number of pairs	19123	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 20: Estimation results : ISIC 15-19 trade with tariffs, 1988-2010
Dependent variable is the level of exports.

Variable	PPML	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	22.768**	(0.004)
West African Economic & Monetary Union	4.823	(0.177)
Central African Economic & Monetary Union	-24.891	(0.37)
Dollarized zone	2.289**	(0.000)
India-Bhutan	19.644	(0.368)
Log of tariffs	0.305**	(0.000)
ECCU $\times \ln \text{tariffs}_{ijt}$	-5.739*	(0.012)
UEMOA $\times \ln \text{tariffs}_{ijt}$	-1.051	(0.411)
CEMAC $\times \ln \text{tariffs}_{ijt}$	8.629	(0.3)
USA $\times \ln \text{tariffs}_{ijt}$	-0.72*	(0.04)
India-Bhutan $\times \ln \text{tariffs}_{ijt}$	-2.985	(0.602)
$\ln \sigma_{tariff}$	0.282**	(0.000)
$\ln Y^{15-19}_{world,t}$	-0.099	(0.196)
Countries are contiguous	0.864**	(0.000)
Pair share a common language	0.493**	(0.008)
Pair belongs to a regional trade agreement	1.008**	(0.000)
Colonizer Variant	0.17	(0.676)
Transitional colonial relationship	0.191	(0.815)
Former subjects of a colonial empire	0.797**	(0.000)
Number of observations	38445	
Number of pairs	8571	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 21: Estimation results : ISIC 20-37 trade with tariffs, 1988-2010
Dependent variable is the level of exports.

Variable	**PPML**	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	-4.197	(0.406)
West African Economic & Monetary Union	6.597*	(0.046)
Central African Economic & Monetary Union	4.973	(0.379)
Australia zone	-12.921**	(0.000)
Dollarized zone	0.697	(0.455)
India-Bhutan	-31.709	(0.239)
Log of tariffs	-0.218**	(0.002)
ECCU $\times \ln \text{tariffs}_{ijt}$	3.052	(0.11)
UEMOA $\times \ln \text{tariffs}_{ijt}$	-1.405	(0.411)
CEMAC $\times \ln \text{tariffs}_{ijt}$	-0.146	(0.938)
USA $\times \ln \text{tariffs}_{ijt}$	-1.059**	(0.003)
India-Bhutan $\times \ln \text{tariffs}_{ijt}$	13.618	(0.175)
$\ln \sigma_{tariff}$	0.126	(0.118)
$\ln Y^{20-37}_{world,t}$	0.561**	(0.000)
Countries are contiguous	0.961**	(0.000)
Pair share a common language	0.359**	(0.000)
Pair belongs to a regional trade agreement	1.022**	(0.000)
Colonizer Variant	-0.139	(0.623)
Transitional colonial relationship	-0.615	(0.123)
Former subjects of a colonial empire	0.374**	(0.004)

Number of observations	46457	
Number of pairs	10571	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

Table 22: Estimation results : Textiles 1990-2012
Dependent variable is the level of exports.

Variable	PPML	
	$-\frac{\hat{\beta}_x}{\hat{\beta}_{\ln distance}}$	p-value
East Caribbean Currency Union	-1.565	(0.101)
West African Economic & Monetary Union	1.237*	(0.012)
Central African Economic & Monetary Union	2.705**	(0.0)
Australia zone	0.269	(0.614)
Dollarized zone	0.581	(0.37)
Eurozone	-0.181*	(0.049)
Krone Zone	4.055**	(0.0)
India-Bhutan	-0.212	(0.654)
Benelux	-0.662†	(0.064)
$\ln Y_{it}^{textile}$	0.473**	(0.0)
$\ln Y_{world,t}^{textile}$	0.167†	(0.056)
Pair belongs to a Regional Trade Accord	0.317**	(0.0)
Colonizer-colonized relationship	0.066	(0.817)
Country pair transitioning from colonialism	-1.260**	(0.0)
Countries were colonies of same country	-0.114	(0.35)
Countries are contiguous	0.341**	(0.0)
Number of observations	111498	
Number of pairs	13687	

P-values in parentheses are calculated from robust standard errors clustered on exporter-importer pair.
Time-varying country effects are not reported.

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