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The European Union and Regional Trade Agreements: Helping or Hurting the Inner Six?

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In this paper, I develop a model that examines the impact of the European Union and other Regional Trade Agreements on trade for the original six member countries of the agreement and their trade partners. I also include a shift-share analysis typically used in regional economic studies and apply it to trade in order to compare the degree of trade creation and trade diversion impacted by these different trade agreements. From my empirical model, I conclude that the European Union creates more trade than Regional Trade Agreements. Furthermore, the shift-share analysis reveals that some European Union accessions divert more trade than Regional Trade Agreements.

JEL classifications: F100, F130, F190
Key words: international trade, trade policy, regional trade agreements, European Union

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I. Brief History of Trade Agreements

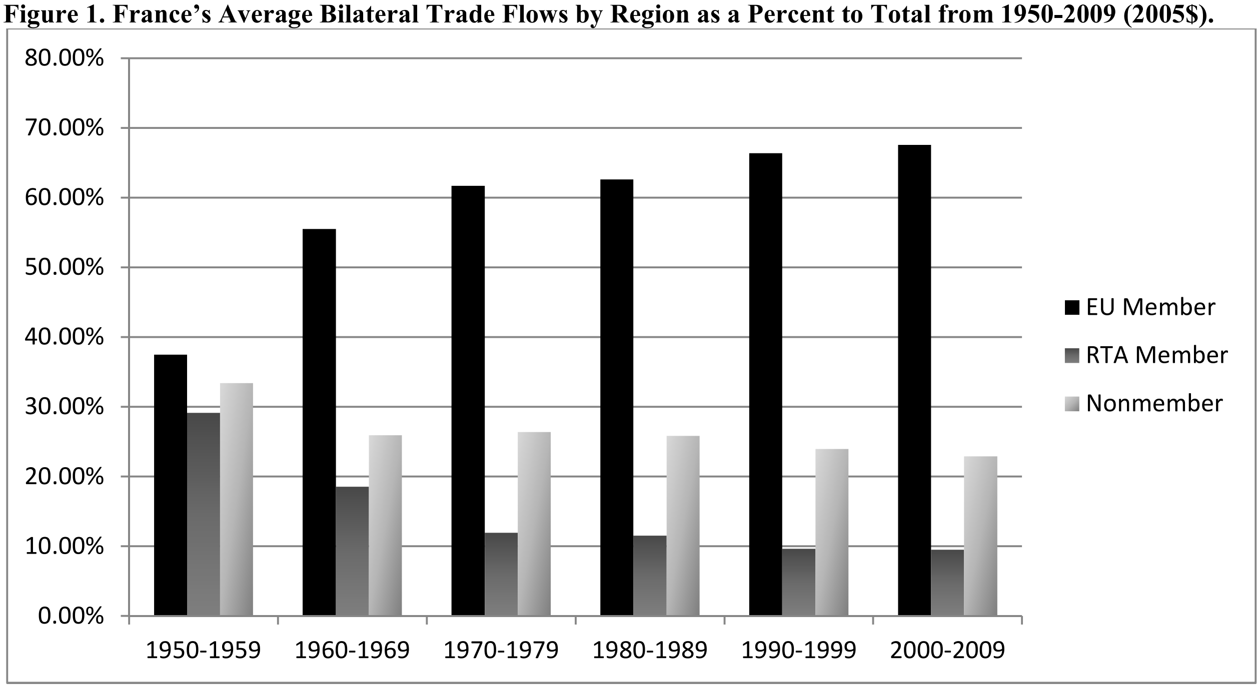
In 1947, the General Agreement on Tariffs and Trade (GATT), later called the World Trade Organization (WTO), was adopted in an effort to lower tariffs and barriers to trade for its member countries. The "Most Favored Nation" (MFN) status guaranteed by the agreement stipulates that member countries must enact equal trade advantages to other member countries (WTO, 2011). However, Article XIV of GATT provides exceptions to the MFN status, one of which allows member countries to discriminate if they have a Regional Trade Agreement (RTA) with other members (WTO, 2011). This discrimination is permitted so long as the trade created as a result of the agreement outweighs trade diverted from other countries. Since the WTO does not formally define trade creation and trade diversion, in this paper, I define trade creation as the increase in the sum of real imports and exports as a result of the RTA. Trade diversion is defined as the decrease in the sum of real imports and exports with countries outside of the agreement.

This paper examines the trade creating and trade diverting effects of the EU and RTAs with the EU for the original six member countries, also called the "Inner Six," and their trade partners. Trade flows are measured by the sum of real imports and exports of the original EU member and their partner countries.

The European Economic Community (EEC), later called the European Union (EU), was formed in 1958 by Belgium, France, Germany, Italy, Luxembourg, and the Netherlands. Figure 1 illustrates France's average bilateral trade flows with its partner countries as a percent of total trade flows for countries who are EU members, have an RTA with the EU, and nonmember countries. As shown in Figure 1, trade dramatically increased around the time that the EEC agreement was formed for the EU member countries and throughout each time period after that, reflecting the various accessions into the EU. This would indicate trade creation.

Simultaneously, trade decreased for the nonmember and RTA countries, indicating trade diversion. Iceland, Norway, and Switzerland formed the first RTAs with the EU in 1973, and other RTAs occurred throughout the following time periods. However, trade continued to decrease for these countries. Thus, are these RTAs with the EU economically beneficial for the countries involved?

Figure 1. France's Average Bilateral Trade Flows by Region as a Percent to Total from 1950-2009 (2005$).



In order to answer my research questions, I use a modified gravity model along with a modified shift-share analysis, typically used in regional economic studies, and apply it to trade.

II. Literature Review

Throughout the past 50 years, the gravity model has been the standard method of measuring the effects of RTAs on trade. The model expresses trade flows as a function of a country pair's distance, economic size, and dummy variables for a common land border, a common language, and the presence or absence of an RTA:

$$\ln T_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln D_{ij} + \beta_4 A_{ij} + \beta_5 L_{ij} + \beta_6 F_{ij} + \varepsilon_{ij} \quad (1)$$

In this equation, T_{ij} denotes the sum of real imports and exports from countries i and j, Y_i and Y_j denotes Real GDP in domestic country, i, and partner countries, j. D_{ij} represents distance between countries i and j. A_{ij}, L_{ij}, and F_{ij} represent dummy variables indicating whether the countries i and j are adjacent, share a common language, and whether there is presence of an RTA, respectively.

Tinbergen (1962) was the first to estimate a gravity equation which expressed the countries' bilateral exports as a function of their individual GNPs and the distance between them. He uses a loglinear regression with cross sectional data for 28 countries in 1958, and includes a dummy variable capturing the effects of the British Commonwealth. The researcher concludes that participation in the British Commonwealth leads to a 5 percent increase in trade.

Aiken (1973) examines trade relations between the EEC and the European Free Trade Agreement (EFTA) from 1951 to 1967. Like Tinbergen's model, the researcher uses a gravity model with the addition of a dummy variable for adjacent countries and the populations of the individual country pairs. He finds insignificant results for the EEC countries from 1951 to 1958. However, after integration in 1959, the EEC coefficient becomes positive and significant. EFTA, which was integrated in 1960, exhibited very similar effects as the EEC, but the EFTA coefficient did not become positive and significant until 1964.

For about 20 years after its development, the gravity model was the main source of estimating the effects of RTAs; however Bergstrand (1985) claimed that it lacked theoretical foundations. Bergstrand (1985) addresses this critique of the gravity model by providing further theoretical studies of the model. The researcher begins by developing a general equilibrium world trade model derived from utility and profit-maximizing agents. He then uses this system to develop a gravity model incorporating perfect substitutability of goods across countries in production and consumption, perfect commodity arbitrage, zero tariffs, and zero transport costs. Bergstrand asserts that the assumption stating that countries share identical production and utility functions, thus yielding constant parameter estimates across all country pairs, is typical to trade analyses such as the Heckscher-Ohlin-Samuelson model of trade. The Heckscher-Ohlin theory of trade predicts that a country exports the goods whose production uses its abundant factors intensively (Salvatore, 2009). Following the assumptions of the Heckscher-Ohlin theory, the Heckscher-Ohlin-Samuelson model adds that trade will lead to equalization in absolute and relative returns to homogeneous factors across countries (Salvatore, 2009). Bergstrand also explains that the use of distance and adjacency variables are a proxy for transport cost factors, and the use of a dummy variable for the presence of an RTA represents changes in tariffs. He finds that the gravity model used in empirical studies closely resembles that of the theoretical model. Furthermore, price variables and currency variables should be included in this model as the researcher finds significant effects of these variables on trade flows.

Bergstrand (1989) extends his previous study of the theoretical foundations of the gravity model by adding factor-endowment and taste variables following the Heckscher-Ohlin theory and subsequent work by Linder (1961). Linder (1961) predicts that trade in manufacturing will be the largest among countries with similar per capita incomes and tastes. Bergstrand uses the gravity model to estimate trade flows for single digit Standard Industrial Trade Classification groups. He includes exporter per capita incomes and finds positive and significant estimates for raw materials, chemicals, machinery and transport equipment, manufactures classified by material, and food products. According to Bergstrand, this suggests that products in these categories tend to be capital intensive in production. For the beverages and tobacco category, he finds a negative and significant coefficient which suggests that these products tend to be labor intensive. The researcher concludes that including variables indicating differing factor-endowments and differing tastes yields a plausible gravity model consistent with trade theory.

In another study, Baier and Bergstrand (2001) attempt to isolate the effects of tariff liberalization, transport cost reduction, and income convergence on world trade growth using cross-sectional data for 16 OECD countries from 1958 to 1960 and from 1986 to 1988. The researchers develop a loglinear gravity model with real trade flows divided by the exporter's deflator as the dependent variable, and the share of the country pairs' GDP, their individual GPDs, transport cost, tariff-rate changes, and a relative price variable as the independent variables. Baier and Bergstrand state that the mean logarithmic growth of trade was 148 percentage points; of this growth, approximately 67-69% could be explained by GDP growth, 23-26% by tariff-rate reductions and trade agreements, 8-9% by declines in transport-costs, and virtually none can be explained by real GDP convergence. They also find that their model explained about 40% of the change in trade flow growth.

Badinger and Breuss (2004) implement a gravity model based on Baier and Bergstrand (2001) to analyze the origin of the growth in intra-EU trade. The researchers use panel data consisting of fifteen EU member states from 1960 to 2000. They determine that income growth had the largest effect on trade and comprises 70 percent of total growth. EU integration and WTO accessions contributed to one-quarter of intra-EU trade growth through tariff reductions. The researchers also found that increased income similarity played a slight role in EU trade growth whereas the reduction in trade costs played no role. Furthermore, they comment that the Baier and Bergstrand (2001) gravity equation explains the model well and the parameter estimates hold true to theoretical predictions.

Further contributing to the literature on EU trade, Papazoglou et al. (2006) examine the impact on trade patterns for ten countries granted accession into the EU and the original fifteen EU member countries. The researchers apply a gravity model to a panel data set across countries from 1992-2003. They find that the addition of the ten accession economies not only creates trade for the original fifteen EU members, but also diverts trade from other regions, particularly in North America and the Far East. In these regions, the share of accession economy exports decrease by 2.52 percent and 2.87 percent, respectively. Also, the increase of exports versus imports depends on the size of the accession countries' economies and their degree of integration with the EU.

Gil et al. (2008) assess the impact of the EU's enlargement throughout each successive shift in formation from a RTA to a monetary union, as well as the accession of 15 member countries. The researchers implement a fixed effects model with dummy variables indicating the various accession dates. They find that the EU increased trade by 63% among members, and that the new members could expand trade at the same pace as the old members. They conclude that the more advanced the integration is (e.g. a monetary union), the greater the intra-regional trade expansion. Finally, the researchers mention that their analysis does not call attention to the welfare implications of the EU, nor the trade effects among non-members.

Since the EU is not only a customs union but also a monetary union, previous researchers have examined the effects of a common currency on trade, rather than using the real exchange rate. Kabir and Salim (2010) maintain that a monetary union in addition to a customs union is rare because most of the countries have their own currencies, and it is typically the small countries that adopt a currency of a large adjacent country. Kabir and Salim (2010) follow the research of Thom and Walsh (2002) who conclude that trade partners using common currency experience enormous gains in bilateral trade flows. The researchers implement a fixed effects gravity model with the inclusion of a dummy variable capturing the effects of a common currency among EU members from 1994 to 2004. The data reveals that members sharing a common regional currency trade 0.113% more than members not sharing a common regional currency.

Among the research on RTAs, Koo et al. (2006) consider the effects of RTAs on agricultural trade. The researchers apply a standard gravity model using dummy variables for four different RTAs: the ASEAN Free Trade Agreement (AFTA), the North American Free Trade Agreement (NAFTA), the Andean Community (CAN), and the EU. The data set consists of the latest available mutual import data for 1999. Overall, the effects of an RTA on agricultural trade were positive and significant for member countries. However, NAFTA was found to have insignificant trade creation effects. The trade diversion effect was also positive, implying that the member countries of these RTAs do not displace agricultural trade with nonmembers. In another study, Carrère (2006) applies a gravity model using panel data for 130 countries from 1962-1996 to examine the effects of seven different RTAs on trade flows. Carrère finds that most of the RTAs exhibited a substantial increase in intra-regional trade, which would indicate trade development. However, the model exhibits a simultaneous decrease in imports, and at times exports from the rest of the world indicating evidence of trade diversion.

Roy (2010) expands the research of Baier and Bergstrand (2007) by separating the effects of Customs Unions (CUs) and Free Trade Agreements (FTAs) on trade flows. Baier and Bergstrand (2007) find that an FTA increases trade by 100% in 10 years after the formation of the agreement. The researcher implements a standard gravity model using the same data set as Baier and Bergstrand (2007), but categorizes the agreements as CUs or FTAs. Roy tests the equality between FTA and CU coefficients to determine whether they have different effects on trade, and concludes that the effects of CUs are statistically different from those of an FTA. He notes that a FTA increases a country pair's bilateral trade by less than 17%, on average as compared to countries who are nonmembers to either agreement. Furthermore, the researcher finds that a CU increases trade by about 77%.

While it is important to examine the effects of RTAs on trade flows, one must also examine the impact of the WTO. Rose (2004) examines whether countries that were members in the WTO traded more than countries who were not a member of the WTO. He uses a fixed effects gravity model using 178 countries with data from 1950 to 1995. The researcher finds small and negative effects for WTO membership and concludes that membership in the WTO does not increase trade. Tomz, et al. (2007) use the data from Rose (2004) to extend the study of the effects of WTO membership on trade. The researchers state that Rose (2004) did not account for the difference between formal and informal memberships. They separate WTO participants who were bound by the agreement into five categories: colonial, de facto, provisional, formal, and nonparticipation. In contrast to Rose's results, the researchers found that the WTO substantially increases trade across all forms of participation compared to countries outside of the agreement.

Subramanian and Wei (2007) focus on the extent to which a country's WTO membership influences trade. First, the researchers list four possible asymmetries in the WTO system based on recent economic theory: 1) developed versus developing country members, 2) imports of members from other members versus imports from non-members, 3) liberalized versus exempted sectors, and 4) new versus old developing country members. Using a gravity model including country fixed effects for 172 countries during 5 year periods from 1950-2000, they found that

WTO membership had a significant impact on trade. However, due to the four asymmetries the impact was uneven across countries. The results show that developed countries who participated more actively as a member of the WTO in reciprocal trade negotiations experienced a large increase in imports. Additionally, the researchers found that when both partners undertook liberalization, bilateral trade increased, and sectors that did not observe liberalization did not witness an increase in trade.

While the gravity model has been the common measure of estimating trade models, several researchers commented on its shortcomings. Egger (2000) states that when using fixed effects panel data, all of the time-invariant variables such as distance and dummy variables for adjacency and language are dropped from the model. Ghosh and Yamarik (2004) claim that researchers disagree on which variables other than GDP and distance should be included in augmented gravity models. Furthermore, the wide range of coefficient values questions whether these other variables are consistently related to bilateral trade (Ghosh and Yamarik, 2004). Clausing (2001) asserts that the dummy variables used to differentiate the effects of RTAs have difficulty capturing solely the effects of trade liberalization. Moreover, the gravity model does not specify the extent of trade diversion relative to trade creation (Clausing, 2001). Furthermore, Clausing (2001) states that previous studies only look at trade at the aggregate level which renders it more difficult to determine whether the effects on trade are due to trade liberalization or other influences.

Unlike previous research, Clausing (2001) strays from the use of a gravity model in her analysis of the impact of the introduction of the Canada-United States Free Trade Agreement (CUSFTA). The researcher develops two regression models derived from a general supply and demand equilibrium. The first regression relates the year to year variation among imported goods to the degree of tariff liberalization, and the second regression adjusts for import shares from Canada in the previous year as an independent variable. She uses disaggregate cross-sectional data at the commodity level to analyze the effects of tariff changes on trade flows from 1989 to 1994. Clausing finds that the tariff liberalization resulting from CUSFTA caused an increase of over $21 billion in U.S. imports from Canada between 1989 and 1994. She also found substantial increases in trade due to CUSFTA, predominantly for goods experiencing the largest tariff liberalizations. Additionally, the data revealed little evidence of trade diversion from non-member countries.

I differentiate this paper from previous research by examining the Inner Six countries separately, rather than aggregating the data for these countries like previous research. This allows for a more complete picture on how the EU and RTAs affect trade flows for the countries involved. This paper also combines two different research areas in trade: 1) the effects of the EU and RTAs with the EU, and 2) whether these effects are trade creating or trade diverting. Furthermore, I employ a unique method, a shift-share analysis in an attempt to quantify trade creation and trade diversion.

III. Methodology

A. Data

This analysis contains five separate panel data sets for Belgium-Luxembourg, France, Germany, Italy, and the Netherlands and their 186 trade partners from 1950 to 2009. Data for Belgium and Luxembourg are combined due to the Belgium-Luxembourg Economic Union formed in 1921. Values of imports and exports in goods were obtained from the International Monetary Fund's Direction of Trade Statistics. In order to facilitate international comparisons, Purchasing Power Parity converted GDP is used to demonstrate differences in the cost of a basket of goods across countries. Purchasing Power Parity converted GDP is obtained from the Penn World Tables. Finally, The World Trade Organization's Regional Trade Agreement Database provides information on regional trade agreements.

B. Before and After Trade Flow Comparisons

My research question asks whether the EU and RTAs with the EU are trade creating or trade diverting for the Inner Six and their trade partners. In order to first examine my research question, I conducted difference-in-means tests on each of the five sets of data to determine whether there is significant difference in trade flows before and after an agreement. Trade flows are measured by the sum of real imports and exports between countries *i* and *j* at time *t*. Country *i* is either Belgium-Luxembourg, France, Germany, Italy, or the Netherlands, and country *j* is their trade partner. To conduct the tests, I separated the partner countries *j* for each country *i* into two categories: EU or RTA member countries. Then, I averaged trade flows with the partner countries *j* ten years before and ten years after joining either the EU or an RTA with the EU. For each country *i,* I averaged the before and after average trade flows for all of the countries *j* in the EU and RTA categories. Table 1 provides the results for EU member countries, and Table 2 provides the results for RTA member countries.

Table 1. EU Difference-in-Means Test

Country	Average Trade Flows 10 Years Before	Average Trade Flows 10 Years After	T- Statistic	Number of Countries
Belgium-Luxembourg	$1,749 ($1,863)	$4,398 ($4,791)	-4.217***	25
France	$2,892 ($2,970)	$7,465 ($8,492)	-3.921***	25
Germany	$9,172 ($10,783)	$19,526 ($18,744)	-4.965***	25
Italy	$2,789 ($2,512)	$6,444 ($5,523)	-4.988***	25
Netherlands	$2,064 ($2,212)	$5,366 ($5,696)	-4.450***	25

Notes: *** Significant at 1% level ** Significant at 5% level * Significant at 10% level
Standard deviations are reported in parentheses. Values are reported in millions.

Table 2. RTA Difference-in-Means Test

Country	Average Trade Flows 10 Years Before	Average Trade Flows 10 Years After	T- Statistic	Number of Countries
Belgium-Luxembourg	$436 ($846)	$861 ($1,521)	-2.959***	36
France	$1,132 ($1,751)	$1,909 ($3,331)	-2.618**	36
Germany	$1,637 ($2,818)	$3,511 ($6,321)	-3.017***	36
Italy	$1,802 ($1,453)	$1,939 ($3,006)	-2.977***	36
Netherlands	$380 ($491)	$941 ($1,295)	-4.010***	36

Notes: *** Significant at 1% level ** Significant at 5% level * Significant at 10% level
Standard deviations are reported in parentheses. Values are reported in millions.

The difference-in-means test results show that there are statistically different effects ten years before and ten years after EU accession and ten years before and ten years after the formation of a RTA with the EU for each of the Inner Six members.

C. Theoretical Framework and Model

In estimating a model which analyzes the effects of the EU and RTAs on trade flows for the Inner Six, I use the Helpman-Krugman (1985) and Markusen (1986) theories of trade. The Helpman-Krugman model examines trade relative to the size of the income of the countries involved (Salvatore, 2009). The Helpman-Krugman model predicts that as a country pair's income converges, the amount of trade is expected to rise. Markusen (1986) adds to this model by accounting for differing taste preferences for goods across countries. If there is a greater demand for differentiated products, then trade flows within the same industry should be larger the greater the income is of the country pair. Also, if developed countries are net exporters of these differentiated products, then intra-industry trade among developed countries should increase relative to trade with less developed countries. (Salvatore, 2009)

I estimate a modified gravity model where the dependent variable is the natural log of the real trade flows variable used in the difference-in-means tests. As an independent variable, I include the ratio of country *j's* real GDP in terms of country *i*, which illustrates the relative size of the trade partner to country *i*. For example, a value of 2 would indicate that the trade partner's GDP is twice as large as country *i*. This variable demonstrates the Helpman-Krugman concept of income convergence in relation to increases in trade flows.

Following Kabir and Salim (2010), I include a time varying dummy variable indicating the dates in which countries adopted the Euro. I also include time varying dummy variables capturing the effects of RTA and EU membership on trade.

I estimate the following model:

$$\ln T_{ijt} = \beta_0 + \beta_1 \frac{Y_{jjt}}{Y_{iit}} + \beta_2 X_{ijt} + \beta_3 E_{ijt} + \beta_4 R_{ijt} + u_{ijt} + \alpha_{ij} \tag{2}$$

Table 3. Variable Definitions

T_{ijt}	Sum of real exports and imports from countries *i* and *j* at time *t*
Y_{iit}	Real Purchasing Power Parity converted GDP of country *i* at time *t*
Y_{jjt}	Real Purchasing Power Parity converted GDP of country *j* at time *t*
X_{ijt}	Time varying dummy variable where 1 equals adoption of the Euro currency, 0 otherwise at time *t*
E_{ijt}	Time varying dummy variable where 1 equals membership in the EU, 0 otherwise at time *t*
R_{ijt}	Time varying dummy variable where 1 equals the presence of an RTA with country *i*, 0 otherwise at time *t*

D. Results

The Hausman test indicated that the fixed effects model should be used for all 5 of the panel data sets. The results of the fixed effects regressions using equation (2) appear in Table 4.

Table 4. Estimated Fixed Effects Model

$$\ln T_{ijt} = \beta_0 + \beta_1 \frac{Y_{jjt}}{Y_{iit}} + \beta_2 X_{ijt} + \beta_3 E_{ijt} + \beta_4 R_{ijt} + u_{ijt} + \alpha_{ij}$$

	Belgium-Luxembourg	**France**	**Germany**	**Italy**	**Netherlands**
Constant	16.718 (0.135)	17.206 (0.141)	18.955 (0.076)	16.628 (0.142)	16.469 (0.102)
Y_{jjt}/Y_{iit}	0.744*** (0.115)	1.138*** (0.291)	1.430*** (0.266)	0.893*** (0.256)	0.495*** (0.860)
X_{ijt}	0.421** (0.179)	0.306** (0.129)	0.165 (0.122)	0.299** (0.133)	0.320*** (0.112)
E_{ijt}	0.733*** (0.108)	0.934*** (0.130)	0.614*** (0.103)	0.778*** (0.129)	0.762*** (0.100)
R_{ijt}	0.277** (0.110)	0.350*** (0.111)	0.277*** (0.099)	0.212* (0.122)	0.259* (0.154)
Year Dummy Variables Included	Yes	Yes	Yes	Yes	Yes
N	182	182	184	182	182
$\overline{T}$	60	60	40	60	60
$N x \overline{T}$	7769	7792	6344	7738	7791
Hausman X^2	330.860***	287.330***	267.570***	358.860***	616.940***
***F* Stat**	35.220***	29.500***	37.830***	25.870***	35.930***
R^2 **Within**	0.469	0.461	0.174	0.488	0.532

Notes: Fixed Effects with robust standard errors reported in parentheses; (yearly data 1950-2009)
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

The estimate for β_1 suggests that a one unit increase in the ratio of the partner country's GDP relative to Belgium-Luxembourg's GDP leads to a 74.4% increase in trade between the two countries. This variable is consistent with the Helpman-Krugman theory prediction, and the findings of Badinger and Breuss (2004). The coefficients for the other Inner Six countries are significant, but the coefficients for France, Germany and Italy are notably larger compared to Belgium-Luxembourg and the Netherlands. A possible explanation for this is that Belgium-Luxembourg and the Netherlands have considerably smaller GDPs than France, Germany, and Italy. If you increase the ratio of the GDPs from 1 to 2 units, that is doubling the ratio of the GDPs. Thus, for France, Germany, and Italy, the magnitude of that one unit increase would be greater than it would for Belgium-Luxembourg and the Netherlands.

The value of β_2 indicates that the partner country's adoption of the Euro is associated with a 42.1% increase in trade between the partner country and Belgium-Luxembourg. With the exception of Germany, the coefficient estimates for the other countries are significant. The partner country's adoption of the Euro has a greater impact for Belgium-Luxembourg and the Netherlands than for France and Italy. These results directly contrast the findings of Kabir and Salim (2010) who assert that the effect of the Euro should be the greatest on trade for France, Italy, and Germany because they are the leading powers in the EU. However, Kabir and Salim (2010) limit their analysis to EU member countries and do not include nonmember countries.

The estimate for β_3 indicates that EU membership leads to a 73.3% increase in trade between Belgium-Luxembourg and the partner country. The coefficients for the Netherlands and Italy are very similar to Belgium-Luxembourg; however, the coefficient for France is about 20% higher, and the coefficient for Germany is about 12% lower. Perhaps, the value for France is higher because France trades more with countries who are EU members due to its status as a leading power in the EU (Kabir and Salim, 2010). A possible explanation for Germany's lower coefficient is that Germany's GDP data does not begin till 1970. Thus, the initial impact of the EU is not captured as it is for the other four regressions. I also find that, according to the value of β_4, the presence of an RTA with EU leads to a 27.7% increase in trade between the partner country and Belgium-Luxembourg. The partner country's RTA membership was significant, but varied in significance level for all of the other Inner Six members. The impact of RTAs was greater for France and was lower for Italy. Because countries have different economical or political relationships with their trade partners, it is possible some RTAs with the EU generate more trade for certain members, like France, than others, such as Italy. Moreover, the values of the RTA and EU membership variables are very similar in magnitude to the findings of Roy (2010).

E. Shift Share Analysis

Since the model fails to specify the extent of trade creation relative to trade diversion, I attempt to resolve this problem by using a shift-share analysis, a technique that has been used in studies of regional economic development (Berzeg, 1978). It decomposes changes, usually in employment in a set of regions to identify industries which have a comparative advantage. The changes are measured at the beginning of the analysis period (t-1), and at the end of the analysis period (t) within each region. Typically, the three regions of this analysis comprise employment in a local industry, such as a metropolitan area, employment nationwide in an industry, and total employment for all industries nationwide. Economic growth or decline in these areas is a combination of three interconnected components: a national share, an industry mix, and a regional shift. The national share examines whether growth in a local region benefits or suffers from the changes in the national economy. The industry mix considers the relative advantage or disadvantage that a nationwide industry has relative to national economic growth of all industries. The regional shift captures the comparative advantage of a region by analyzing the growth rate at the local industry compared to the same industry nationwide. (Berzeg, 1978)

Although this technique has never been used in trade analyses, the purpose of most trade studies is to determine whether trade agreements have a comparative advantage in the region in which it is enacted compared to outside regions. Hence, direct associations can be made between the conventional methodology and its application to trade. Table 5 provides a comparison of the components in a shift-share analysis used in regional economics to the application provided in this paper.

Table 5. The conventional method of the shift-share analysis versus my application

	Conventional method (regional economics)	**My application (trade)**
Shift Share (SS)	Divides local economic growth into its component parts	Divides regional trade growth into its component parts
National Share (NS)	How much employment in a local area increased because of national growth	How much trade in a trade agreement area increased because of national trade growth
Industry Mix (IM)	Relative change of employment in a national industry to the total of all industries	Relative change of trade in a trade agreement area to the total trade of the nation
Regional Shift (RS)	Compares a local industry's growth rate with the same industry's growth rate	Compares trade agreement area's growth rate with the growth rate of the other trade areas

Rather than examining changes in employment, I incorporate changes in real trade flows between France and its partner countries. France is used in this analysis because the RTA and EU coefficient were both significant at the 1% level. The *t-1* period of my application is 10 years before a trade agreement occurred. I chose this value based on the findings of the difference-in-means tests, which indicate that there was a significant impact ten years before and after RTA and EU membership. The *t* period is the year in which the agreement occurred, capturing the shift in the regions. France's partner countries are categorized into three groups, mimicking the different industries in the conventional analysis: EU member countries, RTA member countries, and Nonmember countries.

I conduct this analysis two times first using an EU accession and then using four RTAs with the EU. The local level would be the area in which an agreement occurred. For the first analysis, this would be the EU members and for the second it would be the RTA members. The national industry would be either of the remaining two groups, for the EU accessions it would be the RTA and Nonmembers, and for the RTAs it would be the EU and Nonmembers. The national total would be France's total trade flows. In the conventional method, the regional shift component demonstrates the comparative advantage (or disadvantage) a local industry has compared to a national industry. In this application, the regional shift would demonstrate if the trade agreement is trade diverting for the regions where a trade agreement is formed versus the regions in which there was no agreement. Table 6 illustrates the conventional definitions of each region in this analysis compared to definitions in this paper.

Table 6. Conventional definitions of the various regions versus the modified definitions

	Conventional method (regional economics)	**My application (trade)**
Local Area	Employment changes in a local area such as a metropolitan area	Trade flow changes in an area in which an agreement occurred (EU or RTA countries)
National Industry	Employment changes in an industry at the national level	Trade flow changes where the agreement did not occur (EU, RTA, or Nonmember countries)
National Total	Total employment changes for all industries nationwide	Total trade flow changes for a nation

The first modified shift-share analysis examines the impact of the EU (15) enlargement in 1995. This is when Austria, Finland, and Sweden joined the EU. The second analysis is when Israel, Mexico, Morocco, and South Africa formed RTAs with the EU in 2000. The basis for choosing these agreements is that in the before time period (1985 and 1990, respectively) there were no other RTAs or EU accessions, and that there are close to the same amount of countries who joined the EU and formed RTAs with the EU in those years to facilitate a comparison. Equations 3-6 show the calculations for each component parts of the shift-share analysis:

$$NS = A_{ij}^{\ t-1} * \left(\frac{T_{ij}^{\ t}}{T_{ij}^{\ t-1}} \right) \tag{3}$$

$$IM = A_{ij}^{\ t-1} * \left(\frac{I_{ij}^{\ t}}{I_{ij}^{\ t-1}} \right) - NS \tag{4}$$

$$RS = A_{ij}^{\ t-1} * \left(\left(\frac{A_{ij}^{\ t}}{A_{ij}^{\ t-1}} \right) - \left(\frac{I_{ij}^{\ t}}{I_{ij}^{\ t-1}} \right) \right) \tag{5}$$

$$SS = NS + IM + RS \tag{6}$$

Table 5. Variable Definitions

A_{jt}	Total real trade flows between country *i* and *j* for either the EU or RTA trade agreement areas at times *t* and *t-1*
I_{jt}	Total real trade flows between country *i* and *j* for either the EU, RTA, and Nonmember trade areas at times *t* and *t-1*
T_{ijt}	France's total real trade flows between country *i* and *j* at times *t* and *t-1*

The result of the shift-share analysis for the EU (15) enlargement in 1995 appear in Table 8, and the results of the shift-share analysis for the four RTAs in 2000 appear in Table 9.

Table 6. EU (15) Enlargement in 1995

	RTA	**Nonmember**
SS	$466,201,000,000	$466,201,000,000
NS	$427,942,101,410	$427,942,101,410
IM	-$104,849,879,248	-$39,218,644,065
RS	$143,108,777,838	$77,477,542,655
Number of Countries	36	123

The NS of the EU (15) enlargement reveals that the $427,942 million of growth in trade flows in the EU region was due to total trade flow growth for France. The IM exhibits that although total trade flows increased, the RTA and Nonmember trade flows declined by $104,849 million and $39,218 million, respectively. The RS demonstrates the competitive effect of trade agreements, or the trade creation and trade diversion. In this example, the RS shows that the EU trade flows exceeds the trade flows of the RTA and Nonmember by $143,108 million and $77,477 million, respectively. This number signifies that the EU creates trade for its members as a result of the agreement, and shows the dollar amount of trade which otherwise could have gone to the RTA and Nonmember country groups.

Table 7. Four RTAs with the EU in 2000

	EU	**Nonmember**
SS	$72,728,207,200	$72,728,207,200
NS	$73,645,418,852	$73,645,418,852
IM	-$1,245,082,290	$4,189,011,718
RS	$ 327,870,638	-$5,106,223,370
Number of Countries	26	123

The NS of the four RTAs in 2000 shows that the $73,645 million of growth in trade flows in the RTA region was due to total trade flow growth for France. The IM illustrates that the trade flows in the EU region declined despite the increase in total trade flows. However, the trade flows in the Nonmember region grew as total trade flows increased. The RS shows that the RTA region's trade flows exceed the trade flows of the EU countries by $327 million. However, the trade flows in the RTA region are lower than the Nonmember region's trade flows by $5,106 million. This implies that the RTAs were trade diverting for the EU region, but not for the Nonmember region.

Overall, the results of the shift-share analysis imply that the EU (15) enlargement in 1995 was trade diverting for both the RTA and Nonmember regions, whereas the four RTAs in 2000 were trade diverting for the EU region but not for the Nonmember region. The trade flows as a whole are also larger for the EU member countries than the RTA member countries. The inference that the EU has a larger effect on trade flows can be seen not only in my model but in the shift-share analysis as well.

IV. Conclusion

The purpose of this paper was to analyze the trade creating and trade diverting effects of the EU and of RTAs with the EU on trade flows for the Inner Six and their trade partners. In the first part of this paper, I use a modified gravity model and find that EU membership and membership in an RTA with the EU have a significant impact on trade flows for all of the Inner Six. I find that the partner country's membership in the EU leads to a range of 61.4% to 93.4% increase in trade flows for the Inner Six. Moreover, their partner country's participation in an RTA is consistent with a range of 21.2% to 35% increase in trade flows.

In the second part of this paper, I use a modified shift-share analysis which examines the impact of the EU (15) enlargement in 1995 and of four RTAs with the EU in 2000 on France's trade flows with its partner countries. The purpose of this analysis was to attempt to quantify the amount of trade diversion which does not appear in conventional trade models. When examining the EU (15) enlargement, I find that the agreement diverts trade flows from nonmember countries by $143,108 million, and RTA member countries by $77,477 million. The four RTAs with the EU were trade diverting for the EU countries by $327 million. However, the RTAs were not trade diverting for the nonmember countries as the trade flows for nonmember countries exceeded those of the RTA member countries by $5,106 million. When combined, the modified gravity model illustrates the trade creating effects of RTA and EU membership on members and the modified shift-share analysis exemplifies the extent of trade diversion on the nonmember countries of these agreements.

From a public policy standpoint, these results have several implications. First, because I examined trade flows for the Inner Six countries separately, rather than aggregated flows typically used in the literature, I find differing effects on RTA and EU membership for each of these countries. Since RTAs with the EU affect trade flows for all members of the EU, the countries with which the EU forms RTAs must be carefully chosen such that these agreements are actually beneficial economically for all countries involved. Furthermore, as this study and other studies have shown that different types of agreements have different impacts on trade, countries should examine which type of trade agreement creates the most trade for the countries involved, and diverts the least amount of trade from nonmember countries.

While the shift-share analysis serves as a descriptive tool used to identify trade diversion in this paper, further research should explore methods such as this to quantify the extent of trade creation and trade diversion that is not shown in common trade models. Also, since the data obtained covers imports and exports of merchandise goods, data for trade in services should also be considered in future trade models due to the rise in agreements promoting free trade in services.

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Appendix 1A. List of EU, Euro Zone, and RTA Countries

European Union Members		Euro Zone		RTA Members	
Country	**Year**	**Country**	**Year**	**Country**	**Year**
Belgium	1958	Austria	1999	Iceland	1973
France	1958	Belgium	1999	Norway	1973
Italy	1958	Finland	1999	Switzerland	1973
Luxembourg	1958	France	1999	Syria	1977
Netherlands	1958	Germany	1999	Turkey	1996
Germany	1958	Ireland	1999	Tunisia	1998
Ireland	1973	Italy	1999	Israel	2000
Denmark	1973	Luxembourg	1999	Mexico	2000
United Kingdom	1973	Netherlands	1999	Morocco	2000
Greece	1981	Portugal	1999	South Africa	2000
Portugal	1986	Spain	1999	Macedonia	2001
Spain	1986	Greece	2001	Croatia	2002
Finland	1995	Slovenia	2007	Jordan	2002
Austria	1995	Cyprus	2008	Chile	2003
Sweden	1995	Malta	2008	Lebanon	2003
Hungary	2004	Slovakia	2009	Egypt	2004
Estonia	2004			Algeria	2005
Cyprus	2004			Albania	2006
Czech Republic	2004			Antigua and Barbuda	2008
Poland	2004			Bahamas	2008
Malta	2004			Barbados	2008
Latvia	2004			Belize	2008
Lithuania	2004			Bosnia and Herzegovina	2008
Slovakia	2004			Dominica	2008
Slovenia	2004			Dominican Republic	2008
Bulgaria	2007			Grenada	2008
Romania	2007			Guyana	2008
				Jamaica	2008
				Montenegro	2008
				St. Kitts & Nevis	2008
				St. Lucia	2008
				St.Vincent & Grenadines	2008
				Suriname	2008
				Trinidad &Tobago	2008
				Cameroon	2009
				Cote d`Ivoire	2009

Appendix 1B. List Nonmember Countries

Afghanistan
Angola
Argentina
Armenia
Australia
Azerbaijan
Bahrain
Bangladesh
Belarus
Benin
Bermuda
Bhutan
Bolivia
Botswana
Brazil
Brunei
Burkina Faso
Burundi
Cambodia
Canada
Cape Verde
Central African Republic
Chad
China
Colombia
Comoros
Congo, Dem. Rep.
Congo, Republic of
Costa Rica
Cuba
Djibouti
Ecuador
El Salvador
Equatorial Guinea
Eritrea
Ethiopia
Fiji
Gabon
Gambia, The
Georgia
Ghana
Guatemala
Guinea
Guinea-Bissau
Haiti
Honduras
Hong Kong
India
Indonesia
Iran
Iraq
Japan
Kazakhstan
Kenya
Kiribati
Korea, Republic of
Kuwait
Kyrgyzstan
Laos
Lesotho
Liberia
Libya
Macao
Madagascar
Malawi
Malaysia
Maldives
Mali
Mauritania
Mauritius
Moldova
Mongolia
Mozambique
Namibia
Nepal
New Zealand
Nicaragua
Niger
Nigeria
Oman
Pakistan
Palau
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Qatar
Russia
Rwanda
Samoa
Sao Tome and Principe
Saudi Arabia
Senegal
Serbia
Seychelles
Sierra Leone
Singapore
Solomon Islands
Somalia
Sri Lanka
Sudan
Swaziland
Taiwan
Tajikistan
Tanzania
Thailand
Timor Leste
Togo
Tonga
Turkmenistan
Uganda
Ukraine
United Arab Emirates
United States
Uruguay
Uzbekistan
Vanuatu
Venezuela
Vietnam
Yemen
Zambia
Zimbabwe

Appendix 1C: Difference-in-means Test 5 Years

EU Difference-in-Means Test

Country	Average Trade Flows 5 Years Before	Average Trade Flows 5 Years After	T- Stat	Number of Countries
Belgium-Luxembourg	$1,989 ($2,042)	$3,756 ($3,900)	-4.059***	25
France	$3,316 ($3,204)	$6,411 ($7,032)	-3.745***	25
Germany	$10,734 ($12,859)	$17,753 ($18,000)	-4.045***	36
Italy	$3,200 ($2,966)	$5,723 ($4,958)	-4.463***	25
Netherlands	$2,320 ($2,422)	$4,677 ($4,863)	-4.284***	25

Notes: *** Significant at 1% level ** Significant at 5% level * Significant at 10% level
Standard deviations are reported in parentheses. Values are reported in millions.

RTA Difference-in-Means Test

Country	Average Trade Volume 10 Years Before	Average Trade Volume 10 Years After	T- Stat	Number of Countries
Belgium-Luxembourg	$492 ($961)	$748 ($1,312)	-2.972***	36
France	$1,248 ($1,962)	$1,798 ($3,168)	-2.344***	36
Germany	$1,816 ($3,261)	$2,972 ($5,383)	-2.638**	36
Italy	$1,193 ($1,627)	$1,757 ($2,687)	-2.739**	36
Netherlands	$430 ($574)	$812 ($1,092)	-3.960***	36

Notes: *** Significant at 1% level ** Significant at 5% level * Significant at 10% level
Standard deviations are reported in parentheses. Values are reported in millions.

Appendix 1D: Results including the real exchange rate

$$\ln T_{ijt} = \beta_0 + \beta_1 \frac{Y_{jjt}}{Y_{iit}} + \beta_2 \ln X_{ijt} + \beta_3 E_{ijt} + \beta_4 R_{ijt} + u_{ijt} + \alpha_{ij}$$

	Belgium-Luxembourg	**France**	**Germany**	**Italy**	**Netherlands**
Constant	17.513 (0.263)	17.815 (0.237)	20.923 (0.390)	17.445 (0.278)	16.960 (0.153)
Y_{jjt}/Y_{iit}	0.787*** (0.210)	1.235** (0.614)	0.491 (0.309)	0.891 (0.546)	0.503*** (0.149)
$Ln\ X_{ijt}$	-0.172** (0.077)	-0.192*** (0.063)	-0.347*** (0.125)	-0.243*** (0.089)	-0.124*** (0.035)
E_{ijt}	0.776*** (0.135)	0.836*** (0.150)	0.205** (0.086)	0.758*** (0.159)	0.788*** (0.113)
R_{ijt}	0.233* (0.119)	0.229** (0.113)	0.051 (0.085)	0.138 (0.117)	0.200 (0.161)
Year Dummy Variables Included	Yes	Yes	Yes	Yes	Yes
N	160	160	161	160	160
$\overline{T}$	60	60	19	60	60
$Nx\overline{T}$	6045	6046	2870	5973	6049
Hausman X^2	233.290***	246.380***	95.560***	299.150***	521.750***
F **Stat**	36.090***	32.550***	25.340***	23.730***	40.530***
R^2 **Within**	0.516	0.567	0.202	0.568	0.598

Notes: Fixed Effects with robust standard errors reported in parentheses; (yearly data 1950-2009)
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Table 10. Variable Definitions

T_{ijt}	Sum of real exports and imports from countries *i* and *j* at time *t*
Y_{iit}	Real PPP converted GDP of country *i* at time *t*
Y_{jjt}	Real PPP converted GDP of country *j* at time *t*
X_{ijt}	Real exchange rate from country *j* to country *i*
P_i	CPI of country *i,* obtained from the IMF's International Financial Statistics
P_j	CPI of country *j,* obtained from the IMF's International Financial Statistics
$N_{i/\$}$	Nominal exchange rate of country *i* against the US Dollar, obtained from PWT
$N_{j/\$}$	Nominal exchange rate of country *j* against the US Dollar, obtained from PWT
E_{jt}	Dummy variable where 1 equals membership in the EU, 0 otherwise at time *t*
R_{jt}	Dummy variable where 1 equals the presence of an RTA, 0 otherwise at time *t*

Calculation for the real exchange rate:

$$X_{ijt} = \left(\frac{P_{it}}{P_{jt}}\right)\left(\frac{N_{jt/\$}}{N_{it/\$}}\right)$$