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Changes in Bilateral Trade Costs between European Union Member States & Major Trading Partners: An Empirical Analysis from 1989-2006

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Abstract

Today, more than 50 years after the Rome Treaty, the EU has made great strides in its' economic integration and liberalization of movement of goods and people. International trade theory predicts deepening economic integration inside the European Union will increase regional trade and have large effects on agglomeration of industry patterns. In particular, the Core Periphery theory predicts the core of Western Europe and center of economic prosperity will spread economic growth to the periphery through increased integration. Thus, it is hoped that the EU Core, who benefit from their central location and a long history of integration in Western Europe, will increase growth to the periphery through deepening integration and a relative drop in trade costs. Critics cite the Spring 2010 debt crisis in Greece and subsequent shock to Euro zone stability as an indication that EU integration has not been successful. Given increased skepticism of the Euro zone, measuring changes in trade costs between 2001 Euro adopters and the main trading partners provides one quantitative measure to better understand the depth of EU integration in the recent period from 1989-2006. Using the Novy (2008) model, which measures bilateral trade costs directly from trade flows, the measure includes all trade costs incurred in getting a good to its' final user, other than the production cost of the good itself. Results show the drop in trade costs over the more recent period 1995-2006 to be largest for trade between countries who adopt the Euro in 2001 (-53%). The second largest drop in bilateral trade costs is between 2001 Euro adopters and the Central Eastern European Countries who joined the EU in 2004 (-49%). The third largest drop in bilateral trade costs is between the 2001 Euro adopters group and the large non-continental Europe trading partners (-45%). Large differences in trade costs appear between countries within the 2001 Euro adopters who are considered members of the Core versus those in the Periphery. Over the 1995-2006 period trade costs drop by 24% more for trade within the Core versus Trade between the Core and the Periphery. While the Core-Periphery theory is slow to be realized in our empirical results of trade costs over the 1995-2006 period; trade costs among EU members and Euro adopters are relatively large- 33-53%- when compared to trade costs measured for the non-continental European trading partners-5%. This 7-11 times larger drop in trade costs for trade intra-EU and Euro adopter members- both original and accession- is an empirical testament to the EU's success at integrating diverse economies within the union.

Keywords
International Trade, Core-Periphery, and Economic Geography.
JEL Codes
F11, F12, F15, F16, F17, F43, F55, L60, L71, L91, N14, N74, N94, R11.

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Section 1: Introduction

Today, over 50 years since its' official founding at the 1957 Rome Treaty[1], the European Union has made great strides in trade liberalization of goods between its' members. Fundamentally, not only has European Union integration lowered internal tariffs, thus reducing trade costs, which is trade creating for members; the EU has at the same time lowered multilateral tariffs, thus lessening the effects of trade diversion by creating a more open world trading system for goods. The reduction of trade costs over the geographical space between production sites and markets fueled by lowering tariff barriers due to formation of regional blocs like the European Union plays an integral role in international trade theory and trade policy. Further, trade costs are one of the core inputs to theories of spatial agglomeration in the sub-discipline of Economic Geography. The substantial role trade costs plays in international trade theory is captured by general equilibrium models of trade including the Home Market Effect and the New Economic Geography models published by Paul Krugman in 1980 and 1991 respectively. These two economic models of agglomeration provide an equilibrium story about the centripetal forces that pull economic activities together and those centrifugal forces that push them apart, relying directly on tradeoffs between various forms of increasing returns and mobility costs. In addition to the central role trade costs play in these two models, Obstfeld and Rogers (2000) argue that all major puzzles of international macroeconomics hang on trade costs.

Further, the ability to measure changes in trade costs as a result of the integration of the European Union is particularly salient given the recent troubles threatening the stability of the EU zone. The recent spring 2010 debt crisis in Greece which spread to Spain and Portugal, has been cited as evidence by critics that the EU integration is relatively shallow and has not been successful. Thus the measure of changes in trade costs, between 2001 Euro adopters and other EU members, non-members, and non-continental large trading partners provides a quantitative measure to better understand the depth of EU integration over the recent period 1989-2006. Understanding the relative depths of 2001 Euro adopter integration relative to integration with non-Euro adopter trading partners is one clear quantitative measure of the level of success of EU integration.

Trade costs have traditionally been hard to measure directly. Until recently, economists working with gravity regressions have implicitly assumed a trade cost function by focusing on certain trade cost proxies such as geographical distance, or tariff barriers to measure trade costs. Given trade costs constructed in this manner are estimated, no matter how good of a fit the proxy there remains a number of drawbacks associated with approximating trade functions. In the best case scenario, using a proxy for trade costs provides a good estimate of some of the barriers to trade. This method is hardly convincing as a true measure of trade costs and hence a measure of EU integration. Given these limitations, this work benefits from a new direct measure of trade costs introduced by Novy (2008) which instead of measuring trade costs through a proxy measures trade costs directly based on observed bilateral trade flows. In addition this new measure is a full measure of trade costs and follows Novy (2008), Portes and Rey (2005) and Anderson and Marcouiller (2002) definition of trade costs to include all costs incurred in getting a good to its' final user, other

[1] On March 25, 1957 six countries Belgium, France, the Federal Republic of Germany, Italy, Luxembourg, and the Netherlands signed the Treaties of Rome which gave birth to the European Economic Community (EEC) and to the European Atomic Energy Community.

than the production cost of the good itself. In this model, trade costs include transportation costs (both freight and time costs), policy barriers (tariffs and non-tariff barriers), information costs, contract enforcement costs, currency and language costs, legal and regulatory costs, hidden transaction costs due to poor security, and other red tape. To construct this measure of trade costs, this paper builds on the Novy (2008) model which innovates from the Anderson and van Wincoop (2003) model. The Novy model introduces a micro-founded measure of aggregate bilateral trade costs using a gravity model which solves explicitly for all trade costs and other macroeconomic frictions that impede international trade. This innovation provides a unique new model to measure bilateral trade costs for the EU member countries and large trading partners (26 nations) over the 1989-2006 period. Countries with similar policy as it relates to EU integration are averaged by group and then differences between bilateral trade costs between different groups of partners are compared using three and five year averages.[2] This empirical work further benefits from two natural experiments in the formation of the EU over the period which data is available- the Maastricht Treaty signed in 1992 and the introduction of the Euro in 2002. I aggregate countries with common policy and compare trade costs between the following groups over time:

Group 1: 2001 Euro adopters (11 countries)[3]

Group 2: 2001 EU members who do not adopt the currency (3 countries)[4]

Group 3: Other Western European nations who have not joined the EU (3 countries)[5]

Group 4: 2004 Central and Eastern European Accession members (4 countries)[6]

Group 5: Non-continental European large bilateral trading partners (5 countries)[7]

Relying on three year averages, the difference in trade costs between the period 2003-2006 and the period 1997-1993 is largest for bilateral trade intra-Group 1 with a drop of 53% (see Table 1). The second largest drop in trade costs over the same period is between Group 1 and Group 4 (-49%) and the third largest is between Group 1 and Group 5 (-45%). Preliminary results seem to point that the adoption of the Euro is key for countries who experience the largest drops in trade costs. This is supported by the results from the drop in trade costs between Group 1 and Group 2 (-33%) compared with a drop in trade costs between Group 1 and Group 3 (-37%). The near similar drop in trade costs between countries who are in the EU who do not adopt the Euro and those who are not in the EU, paired with 2001 Euro adopters seems to point out that it is the adoption of the Euro which promotes the highest drop in trade costs. This result is supported by trade theory which tells

[2] The format of this empirical analysis follows from Jacks, Meissner, and Novy (2008).

[3] The 2001 EU currency adopters with available data are the following 11 countries: Austria, Belgium, Finland, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Portugal, and Spain.

[4] Members of the EU in 2001 who choose not to adopt the common currency with available data include: Denmark, Sweden, and the UK.

[5] In 2006, these countries with available data include: Iceland, Norway, and Switzerland. Though, Iceland has subsequently joined the EU in 2009.

[6] The 2004 Central and Eastern European Accession members with data available include: the Czech Republic, Hungary, Poland, and the Slovak Republic.

[7] The large non-continental Europe trading partners with data available include: Canada, South Korea, Japan, New Zealand, and the U.S..

us increased integration should decrease trade costs. Up to this point the drop in trade costs between 2001 Euro adopters and both EU members and large non-continental trading partners shows a relatively large decline over the period (33-53%). To understand whether this is a direct result of EU integration or a reflection of a globally wider trend, I use trade costs intra-non continental European large bilateral trading partners as a proxy for a global trend in trade costs over the period. The result is an overall 5% drop in trade costs intra-non continental Europe's large trading partner (intra-Group 5) which is nearly 11 times smaller than the drop in trade costs intra-2001 Euro adopters (53%). Thus, even if 5% is a low global proxy of the global trend in trade costs over the period, it is clear that EU integration, and particularly the introduction of the Euro, is having a net positive effect on trade costs with all bilateral partners, even those not in the EU.

Further, the empirical measure of bilateral trade costs allows us to test the Core Periphery theory which predicts the core of Western Europe who benefit from their central location and a long history of integration in Western Europe, will increase growth to the periphery through deepening integration and hence a relative drop in trade costs. By including additional groupings measuring trade costs between the Core and the Periphery over the period 2003-2006 and the period 1997-1993, trade costs between the inner six has the largest drop of any bilateral groupings (-73%) over the period, while trade intra-non-inner six[8] has a drop in trade costs (-9%). This result is not surprising since we would expect intra-periphery trade to be low. A more apt measure is core-core vs. core-periphery trade between the period 2003-2006 and the period 1997-1993. Table 7 shows the differences between Core-Core trade costs in Western Europe vs. Core- Periphery trade costs. Core-core trade costs are on average 24% lower than Core-Periphery trade costs over the period indicating the periphery is slow in integrating with the core inside the EU.

Assuming the change in trade costs can serve as a proxy for the level of EU integration between different member states; this paper aims to add value to the literature by supplying a measure of EU integration among different bilateral trading partners. The goal of this research is to provide policymakers with a quantitative measure of EU integration both between member states and non-member states, and to facilitate welfare enhancing policy. Further, this paper hopes to add value to the literature by addressing the question posed by Jagdish Bhagwati's of whether PTAs, such as the EU, are 'building blocks or stumbling blocks' to multilateral integration. The paper is organized as follows. Section 2 and 3 outline the relevant theoretical and empirical existing work and historical framework leading to today's paper. Section 4 details the trade cost model and methodology used in this paper and Section 5 outlines the data. Section 6 summarizes the empirical results and Section 7 concludes.

[8] Non-inner six for which data is available include: Austria, Finland, Greece, Portugal, and Spain.

Section 2: Earlier Empirical Evidence

2.1: Role of International Trade in Economic Growth

International trade theory and empirical studies firmly establish a positive relationship between a nation's ability to trade freely and economic growth. Alfred Marshall stated in his book The Principles of Economics (1890) "the causes which determine the economic progress of nations belong to the study of international trade." Recent empirical work by Silvi Nenci (2009) analyzing the relationship between tariff barriers and world trade growth over the period 1870-2000 confirms the existence of a worldwide level long-term relationship between tariff reductions and trade growth. Thus in both International trade theory and empirical applications there is widespread evidence that reducing frictions on trade is welfare promoting and promotes economic growth.

2.2: Welfare Effects of Preferential Trading Agreements on the Multilateral Trading System

The argument over whether bilateral reductions of frictions on trade created by regional trading blocs are welfare creating for the multilateral trading system has been widely debated among economists. Jagdish Bhagwati in his famous analogy asks whether regional integration, i.e. preferential trading arrangements (PTAs) such as the EU, are "building blocks, or stumbling blocks" to multilateral integration. In his empirical work, Andrew Rose (2004) finds no correlation between membership in the GATT/WTO and a nation's level of trade, and concludes PTAs do not increase multilateral integration. Subramanian and Wei (2003) find instead that the WTO has had a powerful and positive impact on trade, amounting to about 120% of additional world trade (or US$8 trillion) in 2003 alone. Alan Winters switches the focus to the question of whether regionalism sets up forces that encourage or discourage evolution toward a globally freer trading system. The results he finds are inconclusive, as "one can build models that suggest either conclusion, but these models are still so abstract that they should be viewed as parables rather than sources of testable predictions." The jury is still out as to whether regional trading agreements are 'building or stumbling blocs' to multilateral integration. Given the world trading systems over the period 1989-2006 generally followed the trend towards regional instead of multilateral trade agreements, the question has never been more pertinent.

In order to understand the welfare effects of the EU it is important to frame EU integration in the wider global trade setting. There is general agreement among economists that the global trade system took a policy shift away from multilateralism and towards regionalism with the formation of the European Economic Commission (EEC) in 1957. The Treaty of Rome is widely agreed upon by economists as the point of departure for what is referred to as the age of "First Regionalism"[9] or what theorists refer to as the first substantial world trade policy shift towards Preferential Trading Areas (PTAs) (and away from multilateralism). The age of "First Regionalism" and trend towards PTAs did not meet much success beyond

[9] Jagdish Bhagwati (1991) is credited with framing the two world trade policy movements into the ages of First and Second Regionalism. Both periods reflect the move in global trading agreements towards preferential trading agreements and away from multilateralism. His work has roots in Jacob Viner's (1950) work which identified the period from the late 1950s through the 1960s as a period characterized by a global movement towards PTAs.

the European community and its' offshoot the EFTA[10]. Regionalism as a global trend in trade policy is widely considered by economists to have become relevant again in the early 1980s. This period, dubbed by Bhagwati (1991) as the age of "Second Regionalism", began with the shift of U.S. policy towards PTAs and is widely agreed upon to have begun with the Canada-US Free Trade Agreement (CUFTA) signed in 1988 which later expanded to include Mexico in the North American Free Trade Agreement (NAFTA) in 1994. Fujita and Mori (2005) measure levels of agglomeration of GDP by regional trading blocs and find NAFTA yields 35% of world GDP, EU (15 countries) 25%, and East Asia 23%. Thus, 83% of the world's GDP is concentrated in the three regions in 2000. In 1980, the corresponding shares were 27% for NAFTA, 29% for EU, and 14% for East Asia; or the three regions together 70%.[11] Hence, the concentration of the world GDP in the three regions has intensified recently and raises the question again whether regional trade agreements are growth creating.[12] The empirical results of this paper show trade costs declined by 45% on average over the period 1995-2006 between Euro adopters in 2001 and the five major trading partners for which data is available.[13] This large reduction of trade costs between 2001 Euro adopters and the five non-continental European large trading partners (-45%) suggests the EU is a building bloc rather than a stumbling bloc to multilateral trade.

2.3: Welfare Effects on Nation's Internal Growth as a Result of PTAs

An additional aspect to consider when measuring trade costs is the welfare effects inside a country that occur as a result of joining a regional bloc. Three influential papers (Behrens et al. (2003), Krugman (1991), and Fujita et al. (1999). are cited as evidence of uneven, or lumpy growth in industry between regions of a nation as a result of regional integration. The degree of agglomeration which results from regional integration is an important welfare effect to consider when assessing the effects of regional integration.

Behrens et al. develop a model, consistent with the framework of the theory of new economic geography (Krugman, 1991; Fujita *et al.*, 1999), to test the effects of regional integration on a nation's internal intra-regional growth. They find that lowering international trade costs may lead to the dispersion of skilled labor within each country, while reducing inter-regional transport costs is likely to foster its agglomeration.[14] Particularly, the costs to international trade from the transportation of goods and its' role in promoting equitable returns of welfare from trade across regions of nations must be considered when contextualizing gains in trade and hence drops in trade costs.

The empirical work by de la Fuente and Vives (1995), show that economic integration within the EU fosters international convergence across countries but not inter-regional convergence across regions within countries. Further, Hayward (1995) notes that the impact of European integration on the US might differ from American state to state. Or, critically,

[10] The European Free Trade Association (EFTA) was established on May 3, 1960 as a trade bloc alternative for European states who were either unable to, or chose not to, join the then European Economic Community (EEC).
[11] See Fujita and Mori (2005).
[12] More background on the pertinent discussion of whether regional trade agreements lead to a more global free trading system can be found in Bhagwati and Arvine (1996a), Winters (1996), and Behrens et al (2006).
[13] These trading partners are Canada, South Korea, Japan, New Zealand, and the U.S. Data is measured in 3 year averages (2006:2004)- (1997-1995).
[14] Ades and Glaeser (1995) find that good internal transportation infrastructure decreases urban concentration and hence should provide more equitable returns to increased regional integration.

that some U.S. states will thrive while others suffer from stronger import or export competition. The welfare effects of trade integration are thus very relevant for PTAs, and particularly merit consideration of how equitable is the growth internally for member states within the EU. The EU, like other regions, is characterized, even among the most industrialized country by wide and varying levels of regional disparity and heterogeneous agglomeration forces where some industries manifest high degrees of local specialization and others less so. Behrens et al. (2003) note the issue of unequal distribution of benefits across member states is an increasingly pertinent issue in the EU with the 10 new accession countries. Particularly it is likely that membership in the EU will have different welfare benefits for different regions depending on their transportation infrastructures, spatial proximity to the core, and ability to transport goods. The authors argue policy should be directed towards equalizing these welfare benefits to avoid major political disturbances and social turmoil which could be triggered by the potentially uneven distribution of the gains and losses from regional integration. In fact as part of an effort to promote regional integration, EU policy has targeted increasing the transportation network between members. An initial estimate of present and future costs of construction and restoration of the transportation network up to 2015 is EUR 91.5 billion- with 48% of the total transportation budget for the road network and 40.5% for rail.[15] Despite the increased transportation linkages in the EU designed to facilitate movement of goods, spatial agglomeration patterns of industry may remain rigid and serve as an obstacle to equitable growth. This research agenda is of essential importance to understanding the internal, more detailed effects of regional integration in the EU on its' member states and ensuring its' long-term stability. Due to data limitations it was not possible to measure bilateral trade costs between a nation's individual regions for EU member nations. This paper instead measures bilateral trade costs between nations.

Understanding such phenomenon and the underlying drivers of international trade are critical for the European Union's design of efficient urban, regional, and national policies. These ideas, based on the core periphery theory, central in new economic geography models, have been considered carefully in construction of EU policy. Table 7 shows the differences between bilateral trade costs for intra-2001 Euro adopters Core-Core trade and Core-Periphery partners.[16] Core-core trade is on average 24% lower than Core-Periphery trade over the period indicating that the Core-Periphery theory is slow in being realized empirically. This could be a sign of caution for EU policymakers in enlarging the Union. Particularly, given the Core-Periphery trade costs lag by nearly 25% than compared to the Core-Core trade costs among the 11 Western European members who are first to adopt the Euro in 2001 and whose nations are by far much closer in history and past trading patterns,

[15] In 2000 and 2001, the Commission approved EUR 6 billion ISPA funding, with 61 % going to transport projects, equally shared between rail and road (European Commission, 2001). The few statistics available on transport infrastructure investments show that between 1993 and 1995 47 % of infrastructure spending in the ACs went to roads and 42 % to railways. In the EU, road received 62 % of total investment, and rail 29 %, i.e. a larger share than its share in transport volume. Between 1998 and 2000, the Phare programme contributed funding to 52 transport infrastructure projects in the ACs (for a total of EUR 120 million a year), 60 % of which were road projects (IEEP, 2001).Source European Environment Agency (2002)

[16] Of the 11 countries which adopted the Euro in 2001 and we have data for the most standard frequent definition of the Core includes: Austria, Belgium, France, Germany, Italy, Luxembourg, Netherlands, and the UK. While thePeriphery is Finland, Greece, Portugal, Spain, and Switzerland. Though because there is no absolute definition we try different groupings see Figure 7 & 8.

this could bode poorly in the medium term for the Central European Countries who joined the Euro zone in 2004.

2.4: Welfare Effects of EU Regional Integration versus the Costs

What are the welfare aspects to consider when a country decides to enter the EU? A nation should join the EU if the costs of integrating are less than the gains. Clearly, it is difficult to quantify short, medium, and long term costs and gains for a country in joining the EU. Yet, by assessing the relative decrease of trade costs over time between EU members who adopted the currency in 2001 and EU trading partners who are both members and non-members of the EU who do not adopt the common currency, this paper offers a framework to compare experiences of different nations with varying levels of integration within the EU. Further, this work offers a quantitative measure of trade costs to analyze the different decisions Western European countries have made in relation to the EU. This unique dataset offers the ability to measure at the macroeconomic level the decision by Switzerland and Norway not to join the EU vs. the decisions of Denmark, Sweden, and the UK who have joined the EU but opted not to adopt the common currency.

From NEG models we know that there is a decisive role for history in trade patterns. Thus, the high level of historical integration between these Denmark, Norway, Sweden, Switzerland, and the UK with the 2001 Euro adopters makes their potential recent gains from integration potentially less given hundreds of years of trading and relatively low initial trade costs in 1988.[17] Further, these five countries have dynamic extremely competitive economies and the benefits of joining the EU, particularly exchange rate stabilization, may not outweigh the costs of limiting monetary policy. The Euro zone offers the benefits of lowering uncertainty in pricing and transaction costs of cross-border trade. In addition, a positive benefit of the monetary union is it eliminates speculators from making money on exchange rate arbitrage. Economic theory tells us the main cost in joining the Euro zone is the loss of independent monetary policy. This one size fit all approach to monetary policy limits nation's abilities to respond to national asymmetric shocks in business cycles. The recent economic crisis in Greece is one example where a country in crisis was unable to increase its' money supply to increase employment due to restrictions on Greece's monetary policy due to the Euro. For nations, that join the EU, regardless if they join the Euro zone, there are additional costs for integration. The creation of the European Union has required large resources from member states including the creation of EU institutions such as the European Parliament, Council of Ministers, European Commission, European Court of Justice and European Court of Auditors. The effort to bring together more than 495 million people, who speak many different languages and have different cultural backgrounds, will cost in 2010 a total of €141.5 billion. While member contributions are small when compared to total annual revenue for individual nations, administrative costs of harmonizing policy are still worth mentioning.

[17] The European Commission reports the 2010 budget adopted by the European Parliament plenary on 17th December 2009 is €141.5 billion. Of the total budget, the European commission reports spending about six cents of every euro of its' budget on running the European Union. From the 2010 budget this equates to €8.5 billion alone for administration. While this is a relatively small percent of GDP for member nations, it highlights the importance that there must be tangible gains from integration to induce membership.

Focusing back on the choice of some Western European nations decisions not to join the Euro zone, in order to justify the gains of EU integration for Denmark, Sweden, and the UK, the average gains over the period 1995-2006 should be relatively larger than those of Iceland, Norway, and Switzerland. We find the drop in trade costs is larger for the 3 non-member states (-37%) over the period 1995-2006 than the 3 member states who do not adopt the euro (-33%). Clearly, it is simplified logic to only consider the change in trade costs as a value of joining the EU or not. However, it is interesting that the trade costs between these two groups are relatively the same and even higher for Iceland, Norway, and Switzerland who do not join the EU (Iceland does join the EU but not during the 1989-2006 period studied). Due to the heterogeneous history of integration for the six nations discussed above with the 2001 Euro adopters, the comparison between them is not straight forward. This said these results may help explain the decisions by some countries not to join the EU, and particularly why all six countries do not join the Euro zone.[18]

2.5: Role of Trade Costs in Trade and Economic Unions

The available evidence suggests that trade costs can have a large effect on goods traded. Behrens et al. (2005) find a decrease in trade costs and/or in transportation costs to have a direct impact on prices and wages, and thus a significant impact on the economic geography and welfare of each country. Further Anderson and van Wincoop (2003) argue trade costs, defined as all costs to getting a good to market outside of its' production costs, are large, even aside from trade policy barriers and even between apparently highly integrated economies. In their empirical analysis they find total trade costs in rich countries are equivalent to an upward bound on an ad valorem tax equivalent of about 170%- an astonishing result for highly integrated economies. In the recent 2008 article Jacks, Meissner, and Novy (2008) show for France, the UK, and the US that the decline of trade costs explains roughly 55% of the trade boom pre WWI and 33% of the post WWII trade boom. Correspondingly, in the inter-war years (1914-1949) characterized by high tariff barriers, they found a rise in trade costs explains the entire inter-war trade bust. This empirical evidence reflects the significant role trade costs play in patterns of agglomeration and economic growth.

2.6: Measuring Trade Costs

The first best solution to measuring trade costs would be to measure each piece of trade costs directly including among others: tariffs; language barriers; currency barriers; information barriers; contracting costs and insecurity; and non-tariff barriers (NTB)'s- including para-tariff measures such as customs surcharge, tax; price control measures like minimum pricing constraints, anti-dumping measures; finance measures; automatic licensing measures; quality control measures including quotas; monopolistic measures; and technical measures and regulations[19]. However direct measures of trade costs are remarkably sparse and inaccurate. In a review of empirical economic work done on trade costs, Anderson and van Wincoop (2003) cite two general types of indirect trade costs

[18] Iceland application to join the EU was filed on July 16, 2009 and accepted on July 27, 2009. On June 2010, the EU granted candidate status to Iceland by formally approving the opening of membership talks.
[19] NTB categories are based on UNCTAD Coding System of Trade Control Measures.

measures which have been traditional sources used in the literature. The first is inference of trade costs from quantities of goods traded and the second relies on inference of trade costs from prices. Both methods require assumptions in defining a trade cost function. Assumptions in trade cost functions might well be misspecified and its' functional form could omit important trade cost determinants.

Another issue is in practice trade barriers are time varying. For example trade costs change when countries phase out tariffs. Thus, time invariant trade costs proxies such as distance are hardly useful in capturing dynamic trade costs changes over time. Given these types of simplifying assumptions to proxy for trade costs, in the past, researchers have, at best, given good estimates of trade costs using quantities or prices of goods traded.

One of the earliest tractable trade costs measures invented for general equilibrium models comes from Paul Samuelson in 1954 with the idea the 'cost of transporting a good which can be measured as some fraction of the good itself.' Rather than introducing formally a trade cost variable, the costs of trade can be introduced easily into general equilibrium models as a factor of decay. This idea is often framed as that of a floating iceberg, costless, except for the amount of the iceberg itself that melts in transport. This measure is very tractable for modeling transport costs since it impacts no other market and iceberg transport costs have been widely applied in empirical models. In fact, the idea of trade costs as a factor of decay remains a major building block for theoretical models today.

This paper builds on the recent work by Anderson and van Wincoop (2003) whose important work generates a new gravity model. Their model includes multilateral resistance terms, i.e., terms which capture the fact that bilateral trade flows do not only depend on bilateral trade barriers alone but also on relative trade barriers across all trading partners. Anderson and van Wincoop (2003) use a trade function to proxy for trade costs. However, as mentioned above making assumptions on the trade cost function is an approximation and an incomplete measure. Thus to find a quantifiable measure this work follows Novy (2008) who derives an analytical solution for time-varying multilateral trade barriers, or multilateral resistance variables by showing that multilateral resistance variables are a function of how much a country trades with itself, that is intranational trade flows. With the multilateral resistance variable analytically defined from observable trade flow data, one can easily solve the model's gravity equation for a micro-founded bilateral trade cost measure. The benefits of this innovation are two-fold. First, the trade cost measure does not impose bilateral trade cost symmetry. It represents, instead, an average of bilateral trade barriers in both directions and it is therefore consistent with asymmetric trade costs. Secondly, this measure of trade costs is consistent with our definition of trade costs and includes all the costs associated with bringing a good to market, outside of the production costs. This is therefore, a much more comprehensive measure of trade costs, reflecting the full set of trade frictions associated with international trade. Novy (2008) argues the trade cost measure can be interpreted as a 'gravity residual' from the standard gravity equation and the empirical model is outlined in detail in section 4. First, let's zoom out and fit trade costs into gravity models and then into the wider theoretical framework of the field of economic geography.

Section 3: Theoretical Predictions of Trade and Growth

3.1: New Economic Geography Theory Masahisa Fujita describes, "The defining issue of the new economic geography is how to explain the formation of a large variety of economic agglomeration (or concentration) in geographical space." Agglomeration or the clustering of economic activity occurs at many geographic levels, having a variety of compositions including neighborhood, cities and industrial centers, and can often be characterized by high levels of inequality. Understanding what drives patterns of agglomeration is critical to understanding the complex global system of growth and competitiveness.

The current NEG model introduced by Paul Krugman in 1991 builds off of what Nicholas Kaldor calls 'the irrelevance of equilibrium economics' which refers to the long shadow cast by history and accident over the location of production. The home-market effect, an important fundamental in NEG models, is the tendency for large countries to be net exporters of goods with high transport costs and strong scale economies (Krugman (1980) and Helpman and Krugman (1985)). It is predicted by models of trade based on increasing returns to scale but not by models of trade based on comparative advantage. Thus, the NEG model is really a new trade model that includes pervasive increasing returns and imperfect competition; multiple equilibria; and an often decisive role for history, accident, and perhaps sheer self-fulfilling prophecy when measuring agglomeration patterns in trade. The 1991 introduction of the Core and Periphery Model tracks the distribution of economic activity across space as determined by a tension between both agglomeration and dispersion forces. The two agglomeration forces producing the "home market effect" are 1). increasing returns to scale and 2). transport costs which imply that firms want to concentrate production near to large markets. In addition, the "Price Index Effect" or consumer love of variety imply a lower cost to consumers of living near to large markets. These models characterized by the presence of increasing returns, monopolistic competition, and trade costs typically give rise to a more-than-proportional relationship between a country's share of world production of a good and its share of world demand for the same good. Exporters in this scenario, prefer to use a large home market as an export platform. This effect can then be amplified by high trade barriers. It can also work contrary to traditional notions of comparative advantage in factor endowments or productivity. In the NEG model the key innovation is - endogenous location of demand where mobile workers consume where they work and firms require the outputs of the sector as intermediate inputs. The locational co-movement of productive factors and consumers is a prerequisite for agglomeration. From this theoretical framework of agglomeration outlined in NEG models above, the paper will focus on one of the five underlying forces in agglomeration- trade costs.

3.2: Gravity Models

NEG models are founded in general equilibrium and gravity based models. Gravity models are mathematical models based on Newton's gravitational law and used to account for aggregate human behaviors related to spatial interaction such as migration, traffic flows, and trade. For trade flows the gravity model states that the volume of trade can be estimated as an increasing function of the national incomes of trading partners, and a

decreasing function of the distance between them. Gravity based models have had great empirical success in explaining bilateral trade flows. In its simplest form the gravity equation explains flows of a good between pairs of countries in terms of the countries' incomes, distance, and a host of idiosyncratic factors- such as common border, common language, and common money- that enhance or reduce bilateral trade flows. The gravity equation can be written analytically:

$$M_{ijk} = A_{0k} Y_{ik}^{\alpha_{1k}} Y_{jk}^{\alpha_{2k}} d_{ij}^{\alpha_{3k}} U_{ijk} \quad \text{Model (1)}$$

Here M_{ijk} denotes that the k good is exported by country i and imported by country j. Y_{ik} & Y_{jk} are expenditures on the k good by the two countries while d represents distance. A and α's are coefficients and U is a well behaved error term. Aggregating over all k goods, the gravity equation of a given product can be transformed into total exports of country i where now Y can be interpreted as GDP of a country i and j respectively:

$$M_{ijk} = A_0 Y_i^{\alpha_1} Y_j^{\alpha_2} d_{ij}^{\alpha_3} U_{ij} \quad \text{Model (2)}$$

Typically, equation 2 is specified in log linear form and estimated either with cross-section or panel data. In the latter case, a time subscript τ is added, except for the time-invariant physical distance and can be written analytically:

$$\ln(M_{ij\tau}) = \alpha_0 + \alpha_1 \ln(Y_{i\tau}) + \alpha_2 \ln(Y_{j\tau}) + \alpha_3 \ln(d_{ij}) + \alpha_4 F_{ij} + u_{ij\tau} \quad \text{Model (3)}$$

For simplicity in (3) the following terms are shortened: $\ln(A_0) = \alpha_0 \; and \; u_{ij\tau} = \ln(U_{ij\tau})$. The vector of idiosyncratic factors F_{ij} has been included in equation 3 for completeness. The coefficients $\alpha_1 to \; \alpha_3$ are interpreted as elasticities or as percent changes in bilateral trade for one percentage change in income and distance. The coefficient α_4 is positive if the factor is trade enhancing (e.g. common language) and negative if trade reducing (e.g. terrorism).

The NEG model introduced by Krugman in 1991 represents a new branch of economic geography, which aims to explain the formation of a large variety of economic agglomeration in geographical space, using a general equilibrium framework. To date, the NEG remains the only general equilibrium framework in which the location of agglomeration is determined explicitly through a micro-founded mechanism.[20] In particular, NEG models provide an innovation from classic trade theory in that they provide the analytical tools to incorporate: 1). Increasing Returns to Scale (IRS) that are internal to the firm; 2. Imperfect Competition; 3. Trade costs- including transportation costs; 4. Endogenous firm locations: firms enter and exit in response to probability at each possible location. IRS implies that firms have the incentive to select a single site; and 5. Endogenous location of demand-expenditure in each region depends upon the location of firms.

3.3: Location Theory

Gravity and NEG models find their roots in location theory which is concerned with the geographic location of economic activity. Location theory addresses the questions of what economic activities are located where and why. Location theory rests, like classic

[20] See Fujita and Mori (2005)

microeconomic theory, on the assumption that agents act in their own self interest, firms choose locations that maximize their profits and individuals choose locations that maximize their utility. While others including Richard Cantillon, David Hume, Sir James D. Steuart, Walter Isard, David Ricardo, and David Starrett have made core contributions, it was Johann Heinrich von Thünen's first volume of *Der Isolierte Staat* in 1826 that gave birth to location theory. In *Der Isolierte Staat*, von Thünen notes that the costs of transporting goods consumes some of Ricardo's economic rent and transportation costs vary across goods. Thus depending on economic rents, different land uses and use intensities he explains a product's location choice and distance from the marketplace. In his explanation of what factors lead to economic agglomeration, von Thünen, is not only considered the founder of location theory or modern day economic geography, but Paul Samuelson deems him one of the great economists who helped birth the modern economic 'model' which integrates logical deduction with factual experiment.

3.4: The First Law of Geography

Economic Geography's name departs from one of its' founding principles, the first law of geography. In short, the first law of geography states 'everything is related to everything else, but near things are more related than distant things'.[21] This principle is related to the law of universal gravitation which is synonymous with the concept of spatial dependence that forms the foundation of economic geography and NEG models. The spatial configuration of economic activities is the outcome of a process involving two opposing types of forces that is agglomeration (or centripetal) forces and dispersion (or centrifugal) forces. The observed spatial configuration of economic activities is then the result of a complicated balance of forces that push and pull consumers and firms. The gravity model has been widely used in empirical analysis and has been very successful in inferring effects of institutions such as customs unions, exchange rate mechanisms, ethnic ties, linguistic identity and international borders on trade flows. While gravity equations used in empirical applications are known for their strong fit to the data, the estimated empirical equations do not always correspond to those derived theoretically. The theory, first developed by Anderson (1979), tells us that after controlling for size, trade between two regions is decreasing in their bilateral trade barrier relative to the average (multilateral) barrier to trade of the two regions to trade with all their partners. The intuition then is the more resistant to trade a region has with all others a regions, the more it will trade with a given bilateral partner where barriers are relatively lower. Critical to the gravity model used in this paper, Anderson and van Wincoop (2003) define an average trade barrier based in theory and call it multilateral resistance with all other trading partners. Based on the importance of including multilateral resistance variables in gravity equations to obtain theoretically founded empirical results, this paper follows Novy (2008) gravity model based on Anderson and van Wincoop (2003) which defines trade costs directly from trade flows.

Section 4: Empirical Strategy: The structure of this paper follows from the format of Jacks, Meissner and Novy (2008) who focus on measuring trade costs in developed countries, particularly the US, the UK and France over the period 1870-2000. To measure trade costs between bilateral trading partners, they calculate trade costs between years which mark a

[21] See Tobler (1979)

significant shift in global trade- the prewar period (1870-1913); the interwar period (1921-1939); and the post-war period (1950-2000). Following their example, two important events occur over the period 1988-2006 in EU integration which can serve as natural experiments. The first, the Maastricht Treaty, or formally the Treaty of the EU, signed Feb. 1, 1992 by the European Community, led to the creation of the EU and the Euro. The second event is the Jan. 1, 2002 formal adoption of the euro by 12 countries.[22] Because both events were widely anticipated I assume instead of having strict regression discontinuities on the exact year 1992 and 2002, that there is a broader bandwidth of time which absorbss the effects of the events both before and after. For example, the introduction of the Euro in the 12 countries was widely anticipated prior to 2002 and thus it is plausible that the effects on trade costs may appear before the year 2002. For this reason, and as well as to avoid individual year biases, I choose to take three year averages of trade costs between groups as the primary measure of analysis. Finally, because of data limitations, the effects of the Maastricht treaty (1992) is hard to measure. Thus, I focus mainly on the introduction of the common currency in 2002 and the change in trade costs as a result between all EU members, non members, and large trading partners.

Given the available data from 1988-2006, this paper analyzes trade costs for 26 countries for which data is available including: 11 2001 Euro adopters, 3 EU member states who do not adopt the euro in 2001, 4 Central Eastern European Nations who join the EU in 2004, 3 continental Western European states who are not EU members by 2006[23], and 5 large non-continental trading partners of the EU. Because 1988 has the fewest observations of trade costs, I start my three year averages in 1989 and have the following six periods of time for my analysis: Period 1 (1989-1991); Period 2 (1992-1994); Period 3 (1995-1997); Period 4 (1998-2000); Period 5 (2001-2003); Period 6 (2004-2006). I focus on the 1995-2006 period instead of 1989-2006 because many countries in the data set lack data from 1989-1994. Thus, because in period 3 there is a large jump in sample size in trade costs values comparing period 3-6 with period 1 and 2 may have a composition effect, and hence the difference in means may be driven by number of observations instead of actual differences. Thus, I chose to compare periods which have only relatively similar number of observations. As a result, I compare periods 3-6 and periods 1-2, but not periods 1-6 (see Table 1).

The Anderson and van Wincoop Gravity Model: Anderson and van Wincoop (2003) develop their gravity model to measure the effects on trade of borders both intranationally between states and provinces inside the U.S. and Canada and the effects on trade by the international border between the U.S. and Canada. Their paper is a response to the McCallum (1995) empirical work, published in the American Economic Review, which measures similarly the effects on trade of borders between states and provinces and the international border between the US and Canada. For the year 1988, McCallum using gravity based equations in regression analysis, finds that trade between two provinces in Canada is 22 times larger than trade between a province in Canada and a U.S. state. This result created a large stir in the trade literature, prompting Gene Grossman (1998) to classify this result as unexpected, even more unexpected that Trefler's (1995) 'mystery of missing

[22] Countries who adopted the euro in 2002 include: Austria, Belgium, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain.

[23] Note among these 3 Western European states Iceland is included as Iceland's application for the EU was only recently accepted in 2009.

trade'.[24] Anderson and van Wincoop (2003) refute McCallum's (1995) findings and cite two key problems that contributed to McCallum's surprising results of large intra-provincial vs. province-state trade. First, they cite his regression analysis suffers from the problem of omitted variables particularly that of multilateral resistance terms which they correct for and introduce in their 2003 model.[25] Using their model, they find in the case of U.S. and Canada, that even a moderate multilateral barrier between Canada and the rest of the world has a large effect on intra-provincial trade.[26] They argue when economists take into account the multilateral barrier, McCallum's results that trade between two provinces in Canada is 22 times larger than trade between a province in Canada and a U.S. state are severely diminished. Given this example, I conclude the inclusion of multilateral resistance terms is imperative when measuring trade costs.

In their model, they define price differences between locations to represent trade costs that are not directly observable. They define p_i to denote the exporter's supply price in country i, net of trade costs, and assume t_{ij} to be the unobservable trade cost factor between i and j. Then $p_{ij}=p_i t_{ij}$. The exporter passes on these trade costs to the importer. Importantly they assume trade costs are symmetric, that is $t_{ij}=t_{ji}$, They model the unobservable trade cost factor t_{ij} as a log linear function of observables where b_{ij} is a border-related indicator variable, d_{ij} is bilateral distance and ρ is the distance elasticity. Model 4 below is a formal representation of their definition of trade costs.

$$t_{ij} = b_{ij} d_{ij}^{\rho} \quad \text{Model (4)}$$

The key innovation of the Novy (2008) paper is the creation of a direct measure of trade costs (t_{ij}). This is an innovation because it does not assume a trade cost function (like the one illustrated in Model 4) when deriving trade costs. This avoids the potential problem in the Anderson and van Wincoop (2003) model where the trade cost function might omit important trade cost determinants and hence be misspecified. For example their trade cost function (shown above in Model (4)) omits tariffs among other factors affecting trade costs. Second, Novy's (2008) derivation of trade costs follows directly from trade flows which allows trade costs to be asymmetric, or one country to have higher tariffs than another. And third, the Novy (2008) model allows for trade costs to be time variant. The Anderson and van Wincoop (2003) micro-founded gravity equation which measures trade flows is represented in equation 5 below for the two country case:

$$x_{ij} = \frac{y_i y_j}{y^w} \left(\frac{t_{ij}}{\pi_i P_j}\right)^{1-\sigma} \quad \text{Model (5)}$$

Here x_{ij} denotes nominal exports from i to j, y_i is nominal income of country i and y^w is world income defined as $y^w \equiv \sum_j yj$. Further, $\sigma > 1$ is the elasticity of substitution across goods and π_i & P_j represent country i's and country j's price indices. Bilateral trade costs (t_{ij}) decrease bilateral trade and in their model expressed by the equation 4 above and are measured against the price indices π_i & P_j. Anderson and van Wincoop refer to these

[24] See Anderson and van Wincoop (2003)

[25] Multilateral resistance terms take into account the bilateral trade resistance barriers relative to all trade resistance barriers worldwide.

[26] This is mainly because Canada is a small open economy that trades a lot with the rest of the world.

aggregated price indices (6) and (7) below as multilateral resistance variables and assume trade costs with all other partners should be interpreted as average trade costs.

The exact expressions are given by:

$$\pi_i^{1-\sigma} = \sum_j P_j^{\sigma-1}\theta_j t_{ij}^{1-\sigma} \quad \forall_i \quad \text{Outward Multilateral Resistance Variable (6)}$$

$$P_j^{1-\sigma} = \sum_i \pi_i^{\sigma-1}\theta_i t_{ij}^{1-\sigma} \quad \forall_j \quad \text{Inward Multilateral Resistance Variable} \quad (7)$$

Here $\theta_j$is the world income share of country j defined as $\theta_j \equiv \frac{y_j}{y^W}$. While π_i is the outward multilateral resistance variable as it includes bilateral trade costs t_{ij} summed over and weighted by all destination countries j, whereas P_j is the inward multilateral resistance variable as it includes bilateral trade costs t_{ij} summed over and weighted by all origin countries i. There has been wide support in the economics field for the Anderson and van Wincoop (2003) gravity model as it is considered to be an empirical model which is well-founded in economics theory. In particular, model (5) above has theoretical foundations in Anderson's (1979) gravity model which is founded on preferences which are consistent with constant elasticity of substitution (CES) and goods which are differentiated by region of origin. Further model (5) applies the extension of Bergstrand (1989, 1990) and Deardorff (1998) who add monopolistic competition or a Hecksher-Ohlin structure to explain specialization. With the Anderson and van Wincoop (2003) model economists can derive a decomposition of trade resistance into three components: (i) the bilateral trade barrier between region i and region j; (ii) i's resistance to trade with all regions; and (iii) j's resistance to trade with all regions.[27] In the literature, these multilateral resistance variables (6 and 7) have traditionally been difficult to express explicitly. It is Novy's (2008) key innovation, building from the Anderson and van Wincoop (2003) gravity model expressed above in Model (5) that an analytical solution for multilateral resistance variables and hence an analytical measure of trade costs is derived directly from observed trade flows.

In order to do this, Novy uses the insight that a change in bilateral trade barriers does not only affect international trade but also intranational trade. For example, suppose that country i's trade barriers with all other countries increase. In that case, some of the goods that i used to ship to foreign countries are now consumed domestically, i.e., intranationally. It is therefore not only the extent of international trade that depends on trade barriers with the rest of the world but also the extent of intranational trade. To express this formally, beginning from the Anderson and van Wincoop (2003) model (5) he finds an expression for country i's intranational trade (5b).

$$x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{\pi_i P_j}\right)^{1-\sigma} \quad (5) \qquad\qquad x_{ii} = \frac{y_i y_i}{y^w}\left(\frac{t_{ii}}{\pi_i P_i}\right)^{1-\sigma} \quad (5b)$$

Next he solves equation (5b) for the product of outward and inward multilateral resistance as:

$$\pi_i P_i = \frac{x_{ii}/y_i}{y_i/y_w}\, 1^{1/(\sigma-1)} t_{ii} \qquad (8)$$

[27] For further theoretical foundations of the model see Anderson and van Wincoop (2003).

For the explicit solution of multilateral resistance variables he multiples gravity equation (5) by the corresponding gravity equation for trade flows in the opposite direction x_{ji} to obtain a bidirectional gravity equation (9) that contains both countries' outward and inward multilateral resistance variables.

$$x_{ij}x_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2 \left(\frac{t_{ij}t_{ji}}{\pi_i P_i \pi_j P_j}\right)^{1-\sigma} \quad (9)$$

Next by substituting equation (8) into equation (9), Equation (10) follows:

$$x_{ij}x_{ji} = x_{ii}x_{jj}\left(\frac{t_{ii}t_{jj}}{t_{ij}t_{ji}}\right)^{\sigma-1} \quad (10)$$

Now the size variable in (10) is not total income $y_i y_j$ as in traditional gravity equations but intranational trade $x_{ii}x_{jj}$. Equation (10) can be rearranged and is represented in equation (11).

$$\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}} = \left(\frac{x_{ii}x_{jj}}{x_{ij}x_{ji}}\right)^{\frac{1}{\sigma-1}} \quad (11)$$

Now shipping costs between i and j can be asymmetric ($t_{ij} \neq t_{ji}$) and domestic trade costs can differ across countries ($t_{ii} \neq t_{jj}$). Thus, it is useful to take the geometric mean of the barriers in both directions. Finally, to get the final expression for the tariff equivalent we subtract one.[28] Novy's new model represents micro-founded trade costs and is represented analytically in equation 12 below.

$$\tau_{ij} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{\frac{1}{2}} - 1 = \left(\frac{x_{ii}x_{jj}}{x_{ij}x_{ji}}\right)^{\frac{1}{2(\sigma-1)}} - 1 \quad (12)$$

To estimate a country's trade with itself, represented in the equation above as the x_{ii} variable, I follow Shang-Jin Wei (1996) and Novy (2008). They show, due to market clearing, intranational trade $x_{ii} = y_i - x_i$ where y_i is equal to GDP and x_i is equal to total exports, defined as the sum of all exports from country i to the rest of the world. In a two country model of trade between countries i and j the sum of all exports to the rest of the world for country i can be represented as: $x_i = \sum_{j \neq i} x_{ij}$.[29] Thus, the x_{ii} measure is most simply thought of as home demand or a country's total production minus its' total exports.

To ensure that the y_i variable is consistent with the x_i variable, I have to take into account that commonly GDP measures for the y_i variable are based on value added accounting while the x_{ij} or bilateral trade variables use gross shipments accounting. In order to compare like with like, I rely on GDP measures based on gross shipments accounting. To get the gross shipment counterpart of GDP I construct the y_i variable using total goods production accounting. Further, because up to this point the EU is focused on the liberalization of goods I construct all the variables for only the three main tradeable goods sectors- agriculture, mining, and total manufacturing.[30] All variables were transformed to purchasing power parity (PPP) in US dollars by sector to equalize the purchasing power of different countries and thus eliminate differences in price levels between countries. When converted to PPP, the expenditures on GDP for different countries are in effect expressed at the same set of

[28] See Novy (2008) for details.
[29] The x_{ij} variable is simply the exports from country i to country j.
[30] This is consistent with Novy (2008).

prices so that comparisons between countries reflect only differences in the volume of goods purchased. I use the GDP deflator for US$ PPP and hence make the implicit assumption that the inflation rate for the other countries have a similar sectoral composition. This assumption has the potential to bias for economies that are like the US in sectoral composition. However, in my view, the benefits of comparing trade costs in PPP outweigh the lesser costs which come from this transformation.

I follow directly Anderson and van Wincoop (2003) who recommend the optimal level for the elasticity of substitution for industrialized countries be set at σ=8. They cite this elasticity as it is the middle number of the common empirical range of 5 to 10 found for the elasticity of substitution among a survey of empirical work. Intuitively a higher elasticity of substitution means that goods are less differentiated and consumers are more price-sensitive. The more price-sensitive consumers are the fewer foreign goods they would consume if a positive trade cost is associated with foreign goods.[31] It could be argued that the assumption of identical elasticities across sectors is not realistic and should be at least set by sector. But although the elasticity of substitution effects the level of τ_{ij}, it hardly affects the change of τ_{ij} over time. Thus I choose to set the elasticity of substitution at 8.

Finally, the overall intuition behind the trade costs measure, τ_{ij}, expressed in equation (12) is if bilateral trade flows $x_{ij}x_{ji}$ increase relative to domestic trade flows $x_{ii}x_{jj}$ it must have been easier for the two countries to trade with each other. This new measure is more accurate as it is not an estimation of trade costs indirectly through an assumption, but a measure derived directly from the data.

Section 5: Data

All the data for the 26 countries comes from the OECD Structural Analysis (STAN) database. Each of the variables is constructed only to include the tradeable goods sectors- agriculture, mining, and manufacturing. The data was carefully constructed also to ensure that if one of the time series variables was missing a sector, all the other variables dropped that sector as well to make the data for a country comparable over time.[32] Finally, the data was triple checked to avoid measurement error. Given the available data from 1988-2006, this paper computes trade costs for 26 bilateral country pairs. Available data allowed us to measure 11 EU member states who adopt the euro in 2001, three EU member states who do not adopt the euro in 2001, three Western European nations who are not part of the EU, four 2004 Central Eastern European member accession states, and five non-continental European large trading partners.[33] The split between former Czechoslovakia is a non-issue in data

[31] Here I assume that all trade costs are directly passed on to the consumer.

[32] Note both France and Portugal are missing all mining data for the yi variable and thus all other variables have been created to include only the agriculture and manufacturing sector. For the xi variable the following sectors are missing and have been corrected for all other relevant variables: 1).Luxembourg missing entire sector of mining data for the following four countries: Greece, Korea, New Zealand, Slovak Republic; and missing the entire Agricultural Sector for New Zealand; 2). Iceland is missing entire sector of mining data for both Luxembourg and New Zealand; 3). Korea is missing the entire sector of mining and agriculture for Luxembourg; 4). Japan is missing the entire sector of mining for Luxembourg; 5). Hungary is missing the entire sector of mining for Finland; 6). Greece is missing the entire sector of mining for New Zealand; 7). Czech Republic is missing the entire sector of mining for New Zealand; 8). Norway is missing the entire sector of mining data for the following three countries: Czech Republic, Luxembourg, Slovak Republic.

[33] The 11 EU member states who adopt the euro in 2001 include: Austria, Belgium, Finland, France, Germany, Greece, Italy, Luxembourg, Netherlands, Portugal, and Spain. The three EU member states who do not adopt the euro in 2001 are Denmark, Sweden, and the UK and the three Western European nations who are not part of the EU in 2006 are Iceland,

analysis because data available from the former Czechoslovakia is not sufficient to construct the trade costs measure and thus it is not included.

To test robustness I measure trade costs over three year averages and again for five year averages. The results are very similar for trade costs across both three and five-year averages and no large difference is observed (see Figure 2). Given the large similarity between the three-year and five-year trade costs measures across all bilateral partners, I focus on three-year averages as the main form of analysis.

Section 6: Empirical Results

The main outcome indicator is the net change in trade costs between bilateral trade grouping partners over three year average periods. Let's begin by looking at the macro changes over comparable periods from Period 6 (2004-2006) and Period 3 (1995-1997). Importantly, all the different trade group pairings show a drop in trade costs over the period (see figure 1). This supports the argument that regionalism in the case of the EU is a building bloc towards multilateralism. Given prolific expansion of regional trading agreements, one would expect this second wave of regionalism to be accompanied by a drop in trade costs at a global level. This has been the case as the five large non-continental Europe trading partners- Canada, Japan, New Zealand, South Korea, and the U.S. exhibit a 5% drop in trade costs with each other over this period. Despite the fact that these five countries are a small sub-sample of trade costs between large industrialized non-continental European countries, it reflects an important trend. Particularly, this 5% drop is much less than the intra 2001 Euro adopters drop in trade costs of 53% over the same period. And even if the 5% drop in trade between Canada, Japan, New Zealand, South Korea, and the U.S. from Period 6 (2004-2006) and Period 3 (1995-1997) is not representative of a global trend and is relatively low compared to trade costs drops between other highly industrialized countries without data available; the relative drop in trade costs among 2001 Euro adopters over the same period is substantially larger. This indicates a higher rate of change in drop of trade costs between Euro adopters than between large industrialized non-European partners over the same period.

From Table 1, figure 1, and figure 6, using three-year averages, the results in changes in trade costs between period 6 (2004-2006) and period 3 (1995-1997) reinforce that history and patterns of integration matter. Trade costs drop the most during this period for nations which share the highest level and the longest history of integration. Trade costs over this period for the inner six- founders of the 1952 European Coal and Steel Community- Belgium, France, Germany, Italy, Luxembourg, and the Netherlands fell by 73%. It is not surprising that these six nations exhibit the largest drop in trade costs as not only have they been integrating since the 1950s but they all adopted the common currency in 2001. The second largest drop in trade costs is for trade between 2001 Euro adopters (53%).

In order to assess whether our empirical results concur with the core periphery theory which predicts the Core of the EU should successfully spread growth to the Periphery we

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Norway, and Switzerland, the four 2004 Central Eastern European EU member accession states include the Czech Republic, Hungary, Poland, and the Slovak Republic, and the five non-continental European large trading partners including Canada, South Korea, Japan, New Zealand, and the U.S..

group our bilateral trade costs measures to reflect Core-Periphery. To experiment with different identities of which countries make up the Core and which make up the Periphery of the 2001 Euro adopters I include the following three groupings of the Core and Periphery:

> Group 1). Core: Austria, Belgium, France, Germany, Italy, Luxembourg, the Netherlands and the UK; Periphery: Greece, Finland, Portugal, Spain, and Switzerland
>
> Group 2). Group 1 Core + Switzerland; Group 1 Periphery – Switzerland
>
> Group 3). Group 1 Core- Italy; Group 1 Periphery + Italy

Figure 7 shows the main results of these three different Core-Periphery groupings and particularly how the trade costs intra-Core differ in relation to the trade costs of Core-Periphery between the period 6 (2004-2006) and period 3 (1995-1997). Among the 2001 Euro adopters plus Switzerland and the UK, trade costs are on average 24% lower intra-Core than Core-Periphery. Thus the empirical results show even among the highly integrated economies who lead growth in Western Europe, there is evidence that the Core-Periphery theory is slow in being realized empirically.

Switching back to our analysis of how the introduction of the euro fared on different EU trading partners, let us examine the empirical results for the change in trade costs for the Central Eastern European countries who became EU members in 2004. As previously stated, from figure 1, the second largest drop in trade costs (not including the Core-Periphery specifications) is for trade between 2001 Euro adopters and the 2004 Central European accession states. The drop is a striking 49% on average over the period. Much of this large drop in trade costs can most likely be attributed to extra-EU policy and particularly the regime policy shift by the Central Eastern European countries over this period from centrally planned economies to that of free market economies. In order to interpret these results, it is important to attempt to disaggregate the two effects- that of the large removal of barriers on trade associated with the shift to a free market economy and that of accession into the European Union. To disaggregate the country level effects from the wider policy shift towards free market policies in the Central Eastern European countries, I compare bilateral trade costs between a). the Central Eastern European countries and 2001 Euro adopters and b). the Central Eastern European countries and the non-continental Europe large trading partners. Figure 4 shows between period 6 (2004-2006) and period 3 (1995-1997) Group a's bilateral trade costs drop on average by 49% while group b's average trade costs drop by 32%. Thus, about two-thirds of the 49% drop in trade costs with EU 2001 euro zone members can be attributed to the wider policy shift towards free market economies in Central Eastern Europe. Assuming the 32% trade costs drop over the period with the large non-continental Europe trading partners is indicative of the overall trend, we can conclude that the drop in trade costs between Central Eastern Europe 2004 accession members and 2001 euro adopters remains large, at least 17% larger than with other non-continental European large trading partners over the same period.

In figure 1, the third position for the largest drop in trade costs is that between 2001 currency adopters and the five large non-continental Europe trading partners (not including the Core-Periphery groupings), of 45%. This relatively large drop in trade costs between

2001 Euro adopters and the five large non-continental European countries demonstrates the EU has had net positive effects on the multilateral trading system.

The fourth and fifth position for largest drop in trade costs are very close in values and are as following. The fourth position is for a drop of 37% over the period for 2001 currency adopters paired with other European countries not in the EU. The fifth position represents a drop of 33% between 2001 currency adopters paired with members in the EU who did not adopt the common currency. This comparison between these two groups can be seen in Figure 5. The results that non members of the EU had larger gains in trade or bigger drops in trade costs over the period than those who are members but did not adopt the common currency could have several implications. In particular, for the three nations which make up the group of European countries which are not members of the EU in 2006- Iceland, Norway, and Switzerland- there are good reasons why these nations may have low trade costs with the EU. Both Norway and Switzerland have long harmonization and trading histories with the EU 2001 currency adopters. And Iceland, as a small economy, is a net importer nation and thus has large incentives to keep trade barriers to a minimum to stay competitive. Notably, Norway was previously part of a currency union with two current EU members- Denmark and Sweden- indicating high levels of economic integration between the three economies.[34] Switzerland is also a special case due to the banking sector's large success and historical role among nations in Western Europe. Further, while not a formal member of the EU, Switzerland has ratified several integration measures including the free movement of people. All these factors point out that these three countries trade costs with the 2001 Euro adopters may be slightly lower than trade costs between Denmark, Sweden and the UK, due to the particular case of each of these three countries. While one cannot ignore trade theory which predicts deepening regional integration will increase trade and lower trade costs. And the slightly larger drop in trade costs between non EU members and 2001 Euro adopters vs. EU members who do not adopt the currency and 2001 Euro adopters could be interpreted as a contradiction to this theory. Yet, given the very heterogeneous starting conditions and high levels of integration for all 6 countries historically with the 2001 Euro adopters, I interpret these results to indicate that for these 6 nations an almost equal drop in trade costs is observed (33% vs. 37%). Of course, ex post it is difficult to say whether the trade costs drop observed between Denmark, Sweden, and the UK and the 2001 Euro adopters would have been at least as good if they had not joined the EU. These results confirm a much more in depth study focused on the 5 countries is merited (Iceland has subsequently joined the EU). Finally, the similar drop for non-EU members with 2001 Euro adopters is another sign that the EU as a regional bloc is trade creating for multilateralism.

The lowest drop in trade costs is associated with internal trade between large trading partners from non-continental Europe. Thus, the 5% aggregated drop in trade costs between Canada, Japan, Korea, New Zealand, and the U.S. can be viewed as an indicator of the movement of global trade in industrialized nations over the period. This 5% drop over the 1995-2006 period is much smaller than the drop in trade costs between 2001 currency adopters and any other bilateral pair-grouping in our analysis. Assuming the change in trade costs can serve as a proxy for the level of EU integration between different member states,

[34] Past research, Foss et al (2000), suggest that Norway and Sweden are two relatively similar countries in many respect, with both countries' regional policy aims and measures moving towards the EU's. However, because of EU membership Sweden's regional policy is moving faster than Norway's.

this relatively larger trade costs drop intra 2001 Euro adopters (-53%) vs. intra-non-continental European large trading partners (-5%) indicate a high level of integration intra 2001 Euro adopters relative to integration of other large trading partners outside the EU. This result empirically supports the first law of geography and NEG models as we observe nations which are physically closer have lower bilateral trade costs indicating a negative relationship between trade and distance. The nearly 11 times observed larger drop in trade costs between intra-EU 2001 currency adopters and 2001 currency adopters and large non-continental trading partners indicates that the EU is functioning and creating relatively higher levels of integration between its' members than outside partners.

Section 7: Conclusions and Recommendations for Future Research

This work benefits from a new direct measure of trade costs introduced by Novy (2008) which instead of measuring trade costs through a proxy measures trade costs directly based on observed bilateral trade flows. The empirical results of trade costs over the period 1988-2006 and particularly focused on the comparable period 1995-2006 are clear. The biggest drop in trade costs over the 1995-2006 period is for intra-EU members who adopt the 2001 currency (53%). Thus, despite skeptics critique that the EU integration is relatively shallow and has not been successful, the quantitative comparative measures of country groupings' bilateral trade costs prove the Euro zone has had substantial effects on its' members trade costs. A more detailed look at trade costs between different Core and Periphery members of the 2001 Currency adopters shows among the 2001 Euro adopters plus Switzerland and the UK, over the main period of study 1995-2006, trade costs are on average 24% lower intra-Core than Core-Periphery. Thus the empirical results show even among the highly integrated economies who lead growth in Western Europe, there is evidence that the Core-Periphery theory is slow in being realized empirically. This could be a sign of caution for EU policymakers in enlarging the Union. In particular, if trade costs are relatively higher for the Periphery and Core of the 2001 Euro adopters, whose nations are by far much closer in history and past trading patterns, other more recent members could expect longer lag times for real economic integration.

While the Core-Periphery theory is slow to be realized in our empirical results of trade costs over the 1995-2006 period; trade costs among EU members and Euro adopters are relatively large- 33-53%- when compared to trade costs measured for the non-continental European trading partners-5%. The second largest gain is that of the Central Eastern European countries paired with 2001 Euro adopters, with a 49% drop. After I net out the wider policy shift of the Central Eastern European economies to free market economies, trade costs between the 2001 EU currency adopters and the Central European Economies remain a sizeable 17% above the global average drop in trade costs.

The third largest drop in trade costs over the 1995-2006 period are aggregated trade costs between the non-continental European large trading partners and the 2001 Euro adopters, a 45% drop. Thus, even large trading partners outside of continental Europe have seen large relative gains in competitiveness (large drops in trade costs) due to EU integration and particularly due to the adoption of the Euro. Given these empirical results, this research points towards EU integration as a 'building bloc' rather than a 'stumbling bloc' to multilateral integration. The experience of Non-EU Western European countries-Iceland,

Norway, and Switzerland- 37% drop in trade costs- and the 2001 EU members-Denmark, Sweden, and the UK- 33% drop in trade costs- with 2001 Euro adopters support that the EU is trade creating also for Western European nations which do not adopt the Euro, both inside and outside the EU.

Even for new accession members with vastly different economic history and trading patterns, membership in the EU has lead to relatively large drop in trade costs, 7-11 times that of intra-EU non continental large trading partners in the recent period (1995-2006). These results point out the EU is fulfilling its' purpose by increasing regional integration among its' members and is an empirical testament to the EU's success at integrating diverse economies within the union.

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Contents for Tables, Figures, and Appendices

Table 1: Changes in Trade Costs (TC) over the Period 1989-2006 for 2001 Euro Adopters[1] and Other Relative Country Groupings (Three Year Averages)[2]

	Country Groups (a-h)		Changes in Trade Costs Period 2-1 (1994:1992)-(1991:1989)	Changes in Trade Costs Period 4-3 (2000:1998)-(1997:1995)	Changes in Trade Costs Period 5-3 (2003:2001)-(1997-1995)	Changes in Trade Costs Period 6-3 (2006:2004)-(1997:1995)
a	Intra-2001 Euro adopters	TC	-4%	-43%	-50%	-53%
		n	193	281	293	293
b	2001 Euro adopters paired with Members of the EU in 2001 who did not adopt the common currency[3]	TC	-3%	-25%	-30%	-33%
		n	156	162	183	183
c	2001 Euro adopters paired with Central Eastern European Countries who become EU members in 2004[4]	TC	...	-27%	-42%	-49%
		n	0	226	232	232
d	2001 Euro adopters paired with other European countries not in the EU[5]	TC	-2%	-27%	-32%	-37%
		n	159	184	186	187
e	2001 Euro adopters paired with Large Trading Partners from Non-Continental Europe[6]	TC	-1%	-26%	-33%	-45%
		n	225	307	312	285
f	Bilateral Trade between Large Trading Partners from Non-Continental Europe[6]	TC	5%	-4%	-4%	-5%
		n	40	60	60	49
g	Bilateral Trade between Inner Six-France, Germany, Italy, Belgium, Netherlands, and Luxembourg	TC	-2%	-65%	-71%	-73%
		n	54	65	72	72
h	Bilateral Trade between Non-Inner Six 2001 Euro adopters-Austria, Finland, Greece, Portugal, & Spain	TC	-5%	-8%	-8%	-9%
		n	36	60	60	60

1. 2001 EU Member and Currency Adopters include the following 11 countries: Austria, Belgium, Finland, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Portugal, and Spain. Data was not available for Ireland.

2. Data is from the OECD STAN Database and is available only for the following 26 EU, European, and other Trading Partners: Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Poland, the Slovak Republic, Spain, Sweden, Switzerland, UK, and the US.

3. Members of the EU in 2001 who did not adopt the common currency include: Denmark, Sweden, and the UK.

4. The Central Eastern European Countries who are EU Accession members and Currency Adopters in 2004 include: the Czech Republic, Hungary, Poland, and the Slovak Republic

5. Other European Countries not in the EU during this time period include: Iceland, Norway, and Switzerland.

6. Large Trading Partners from Non-Continental Europe include: Canada, Korea, Japan, New Zealand, and the U.S.

Table 1B: Trade Costs over the Period 1989-2006 for 2001 Euro Adopters[1] and Other Relative Country Groupings (Five Year Averages)[2]

Country Groups (a-h)			Changes in Trade Costs Period 2-1	Changes in Trade Costs Period 3-2	Changes in Trade Costs Period 4-2
			(1997:1993)-(1988:1992)	(2002:1998)-(1997:1993)	(2006:2003)-(1997-1993)
a	Intra-2001 Euro adopters	TC	-5%	-46%	-52%
		n	353	456	413
b	2001 Euro adopters paired with Members of the EU in 2001 who did not adopt the common currency[3]	TC	-4%	-26%	-31%
		n	268	296	267
c	2001 Euro adopters paired with Central Eastern European Countries who become EU members in 2004 and adopt currency[4]	TC	-2%	-36%	-50%
		n	156	360	322
d	2001 Euro adopters paired with other European countries not in the EU[5]	TC	-4%	-29%	-35%
		n	267	302	273
e	2001 Euro adopters paired with Large Trading Partners from Non-Continental Europe[6]	TC	-6%	-30%	-43%
		n	401	496	420
f	Bilateral Trade between Large Trading Partners from Non-Continental Europe[6]	TC	9%	-2%	-3%
		n	73	96	75
g	Bilateral Trade between Inner Six-France, Germany, Italy, Belgium, Netherlands, and Luxembourg	TC	1%	-64%	-69%
		n	90	113	105
h	Bilateral Trade between Non-Inner Six 2001 Euro adopters-Austria, Finland, Greece, Portugal, & Spain	TC	-10%	-9%	-11%
		n	72	92	82

1. 2001 EU Member and Currency Adopters include the following 11 countries: Austria, Belgium, Finland, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Portugal, and Spain. Data was not available for Ireland.

2. Data is from the OECD STAN Database and is available only for the following 26 EU, European, and other Trading Partners: Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Poland, the Slovak Republic, Spain, Sweden, Switzerland, UK, and the US.

3. Members of the EU in 2001 who did not adopt the common currency include: Denmark, Sweden, and the UK.

4. The Central Eastern European Countries who are EU Accession members and Currency Adopters in 2004 include: the Czech Republic, Hungary, Poland, and the Slovak Republic

5. Other European Countries not in the EU during this time period include: Iceland, Norway, and Switzerland.

6. Large Trading Partners from Non-Continental Europe include: Canada, Korea, Japan, New Zealand, and the U.S.

Figure 1 : Difference in Trade Costs over Relevant years for Different Bilateral Trade Groupings

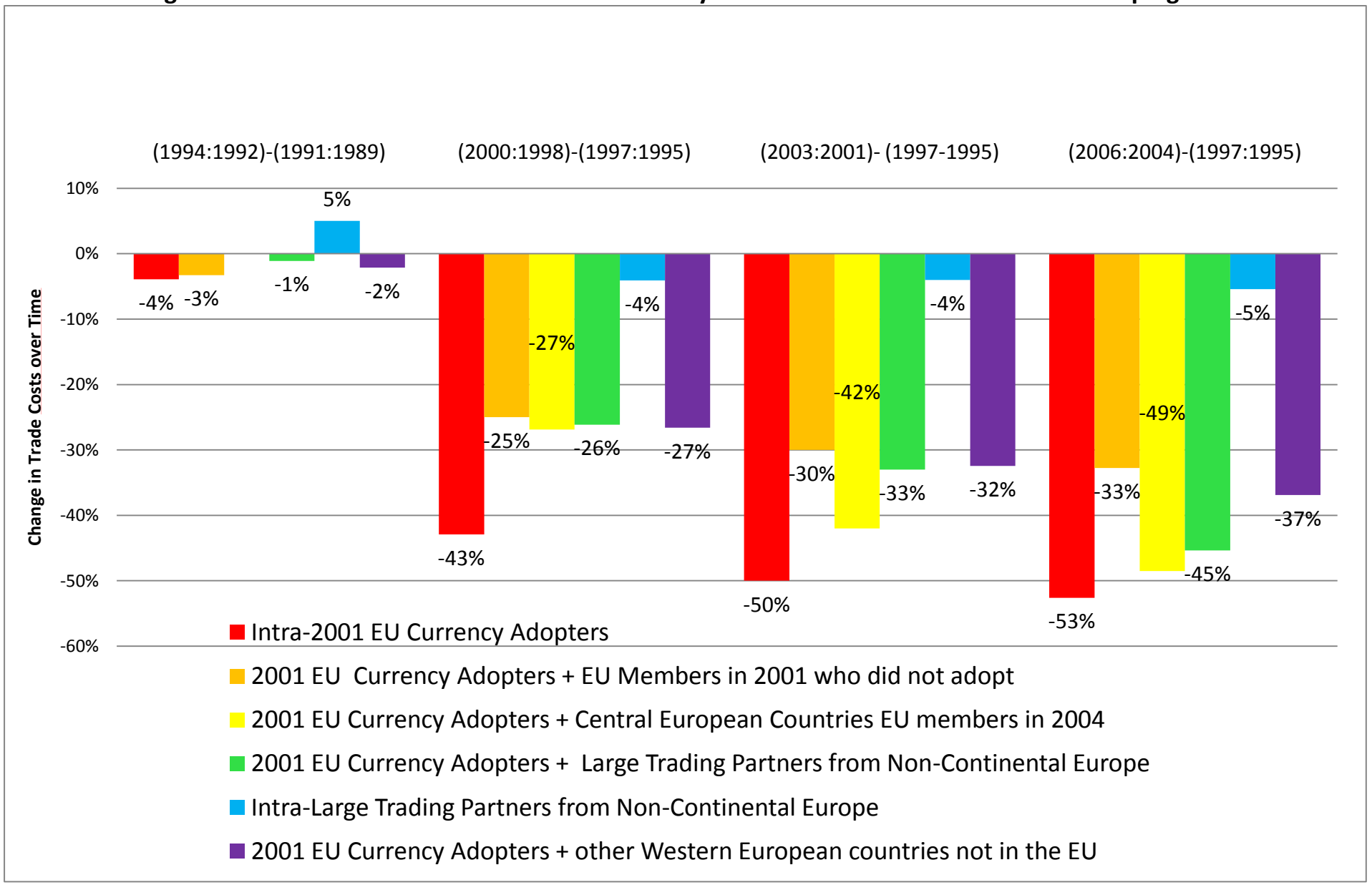
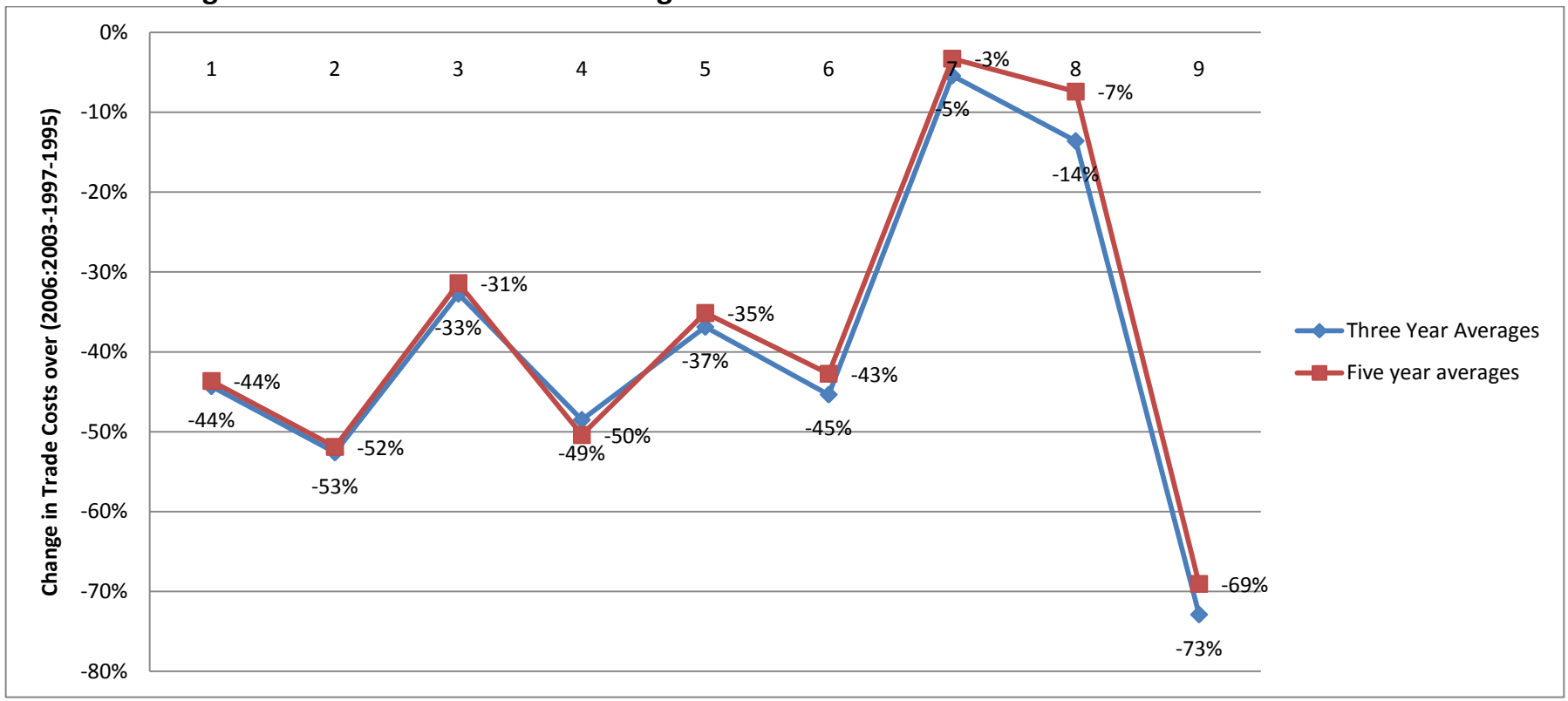


Figure 2: Three and Five Year Average Differences in Trade Costs for Bilateral Partners 1-9



Key for Bilateral Trade Partners Represented	
1	2001 Euro adopters paired with all Continental Europe Bilateral Trading Partners
2	2001 Euro adopters Paired with 2001 EU Member and Currency Adopters
3	2001 Euro adopters paired with Members of the EU in 2001 who did not adopt the common currency
4	2001 Euro adopters paired with Central European Countries who become EU members in 2004
5	2001 Euro adopters paired with other European countries not in the EU
6	2001 Euro adopters paired with Large Trading Partners from Non-Continental Europe
7	Bilateral Trade between Large Trading Partners from Non-Continental Europe
8	Bilateral Trade between Large Trading Partners and European states who are not part of the 2001 common currency
9	Bilateral Trade between Inner Six-France, Germany, Italy, Belgium, Netherlands, and Luxembourg

Figure 3: Proxy for Global Trends of Changes in Trade Costs Relative to the 2001 Euro adopters

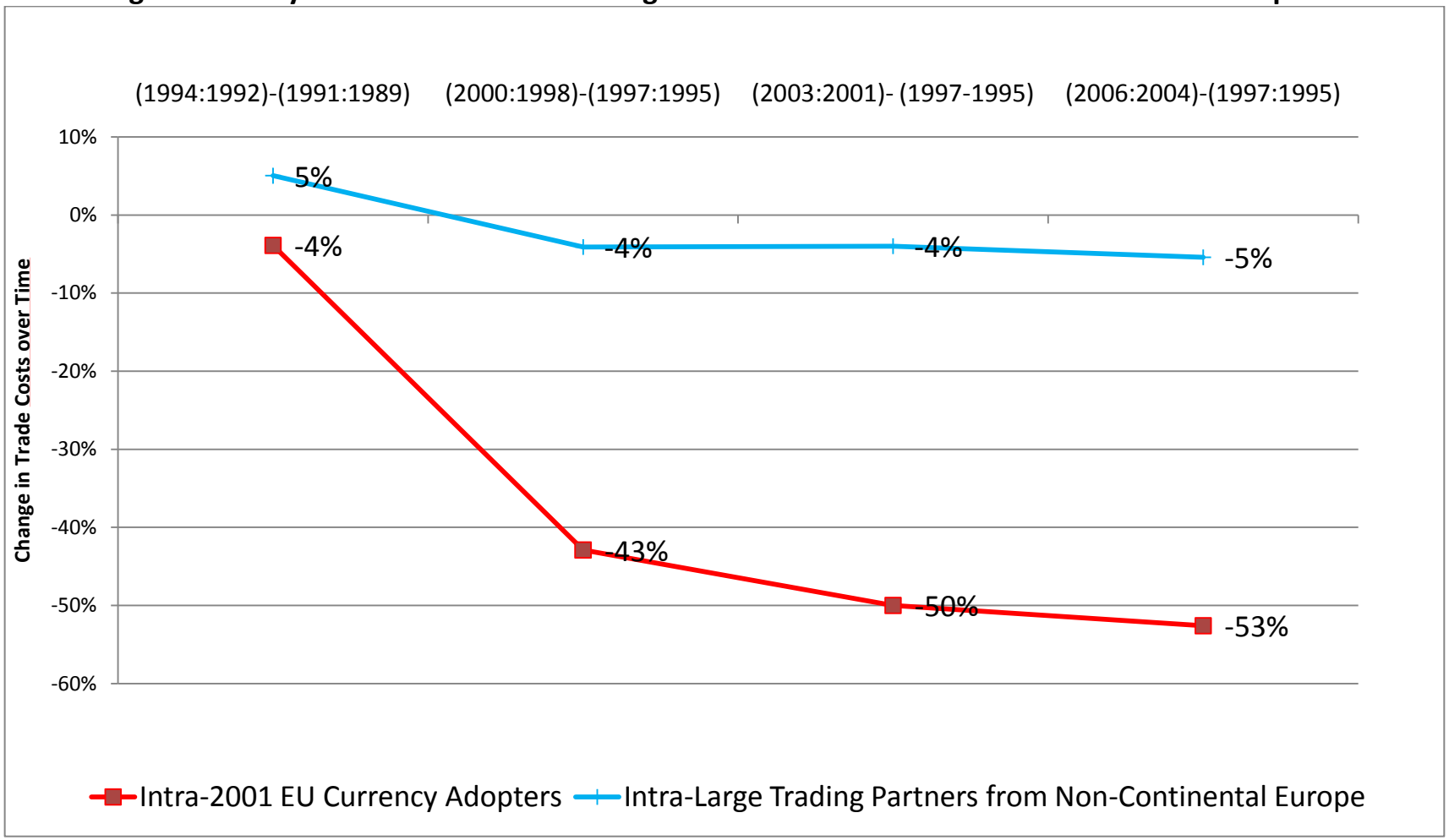


Figure 4: Bilateral Trade Costs for the Central Eastern European 2004 Accession Members

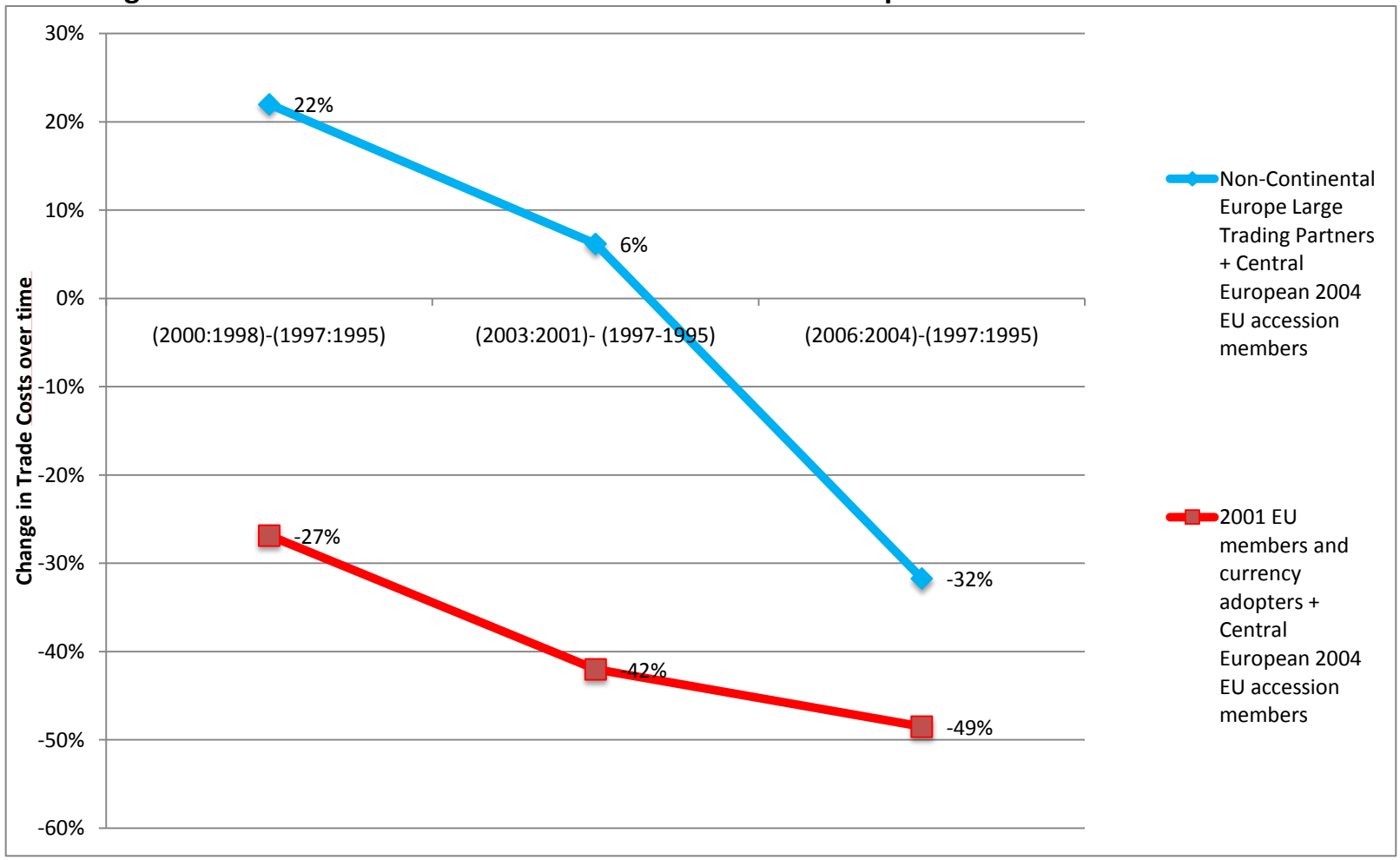


Figure 5: Difference in Change in Trade Costs between EU Members who do not adopt the common currency Vs. Continental Western Europe nations who are not in the EU in 2006 both partnered with 2001 Euro adopters

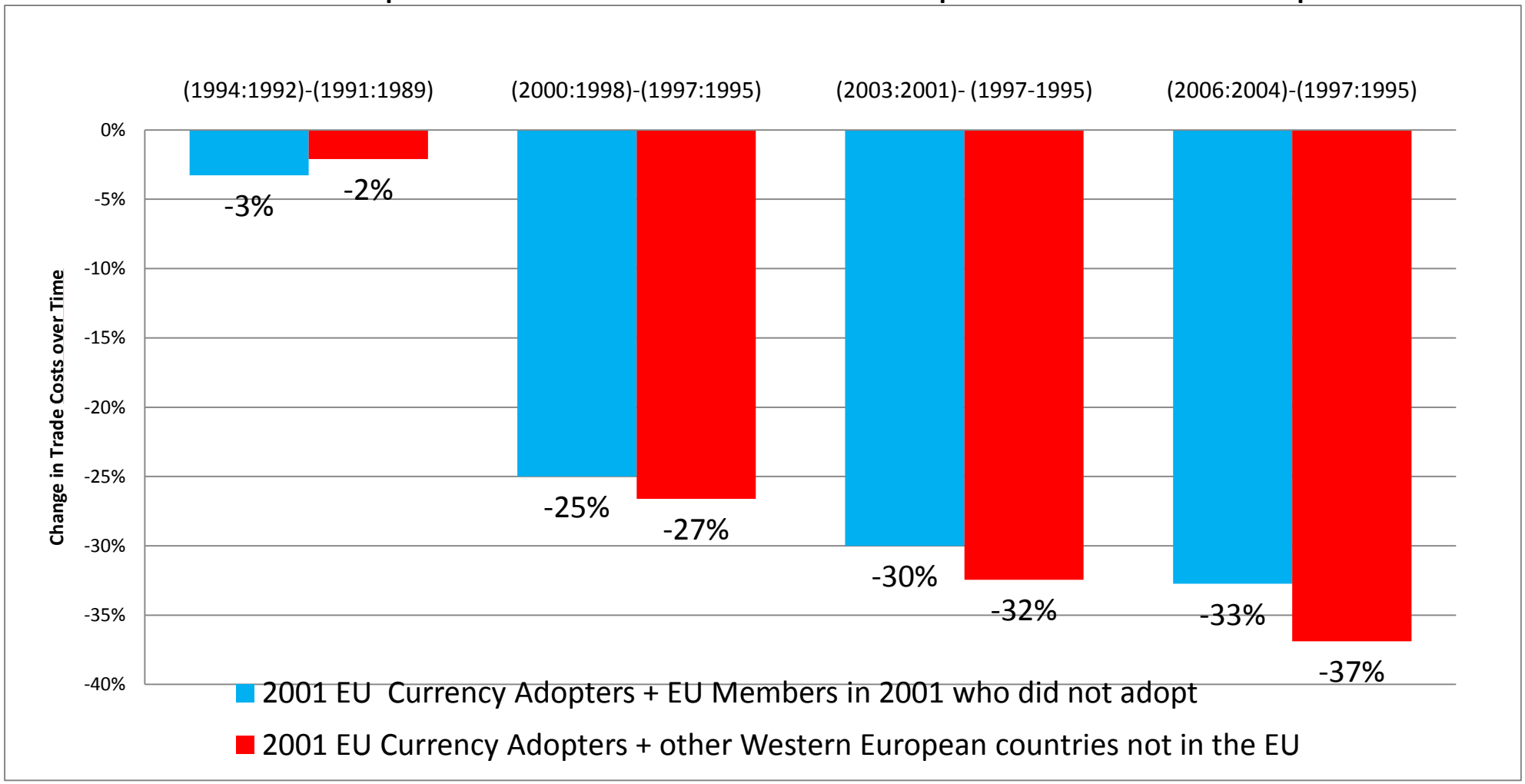


Figure 6: Trade Costs for intra-EU inner six, intra-2001 Euro adopters and intra 2001 Euro adopters who are not part of the inner six

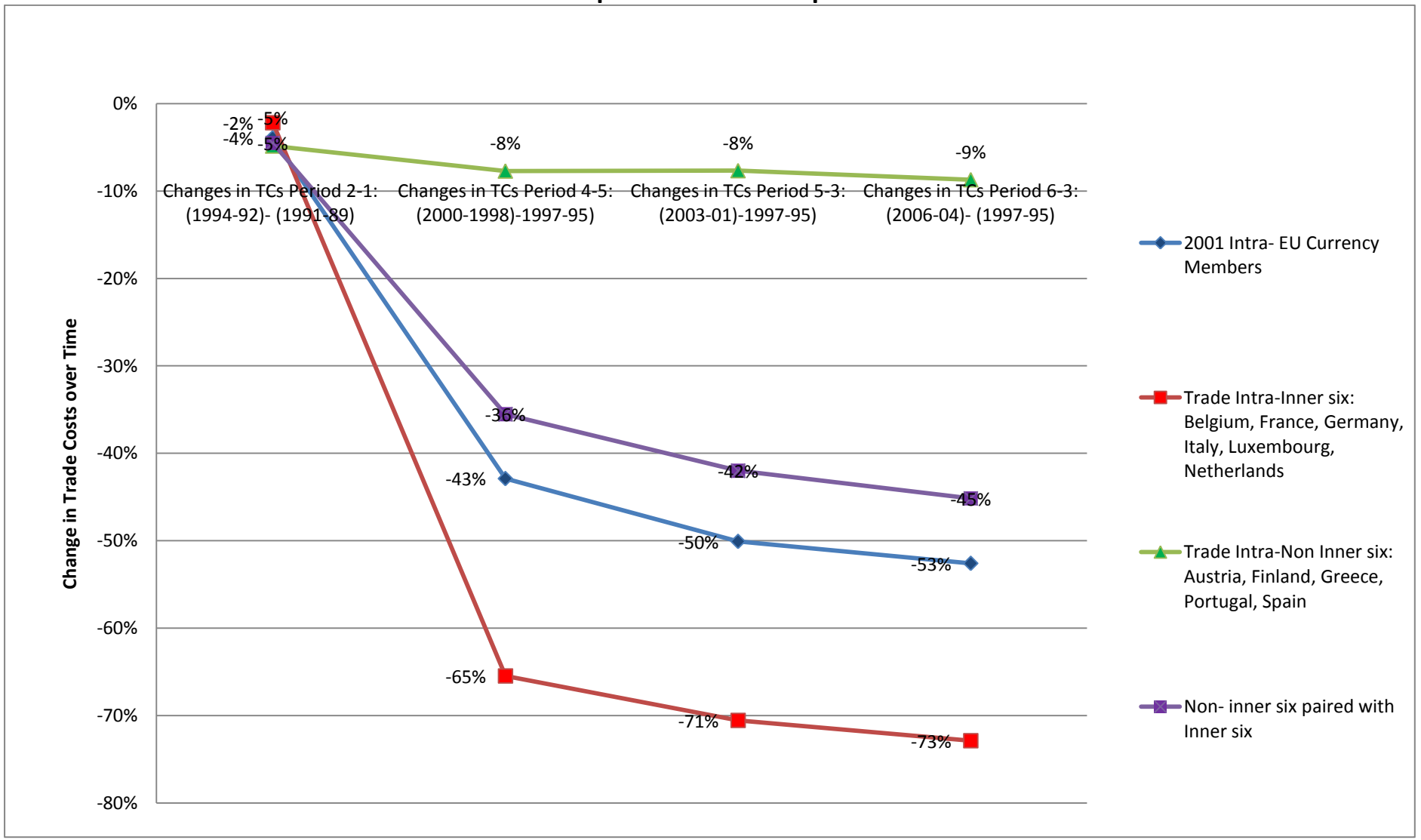
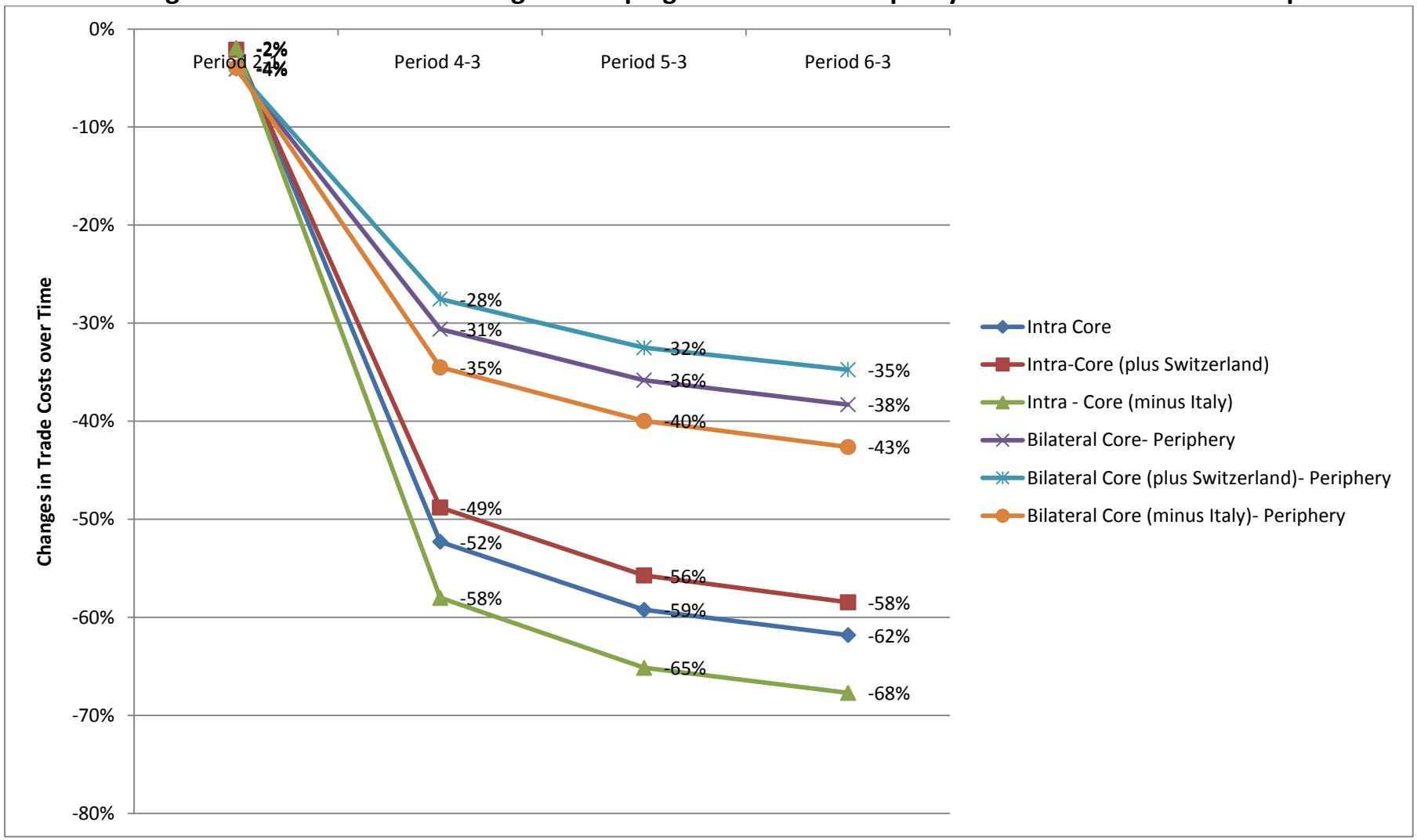
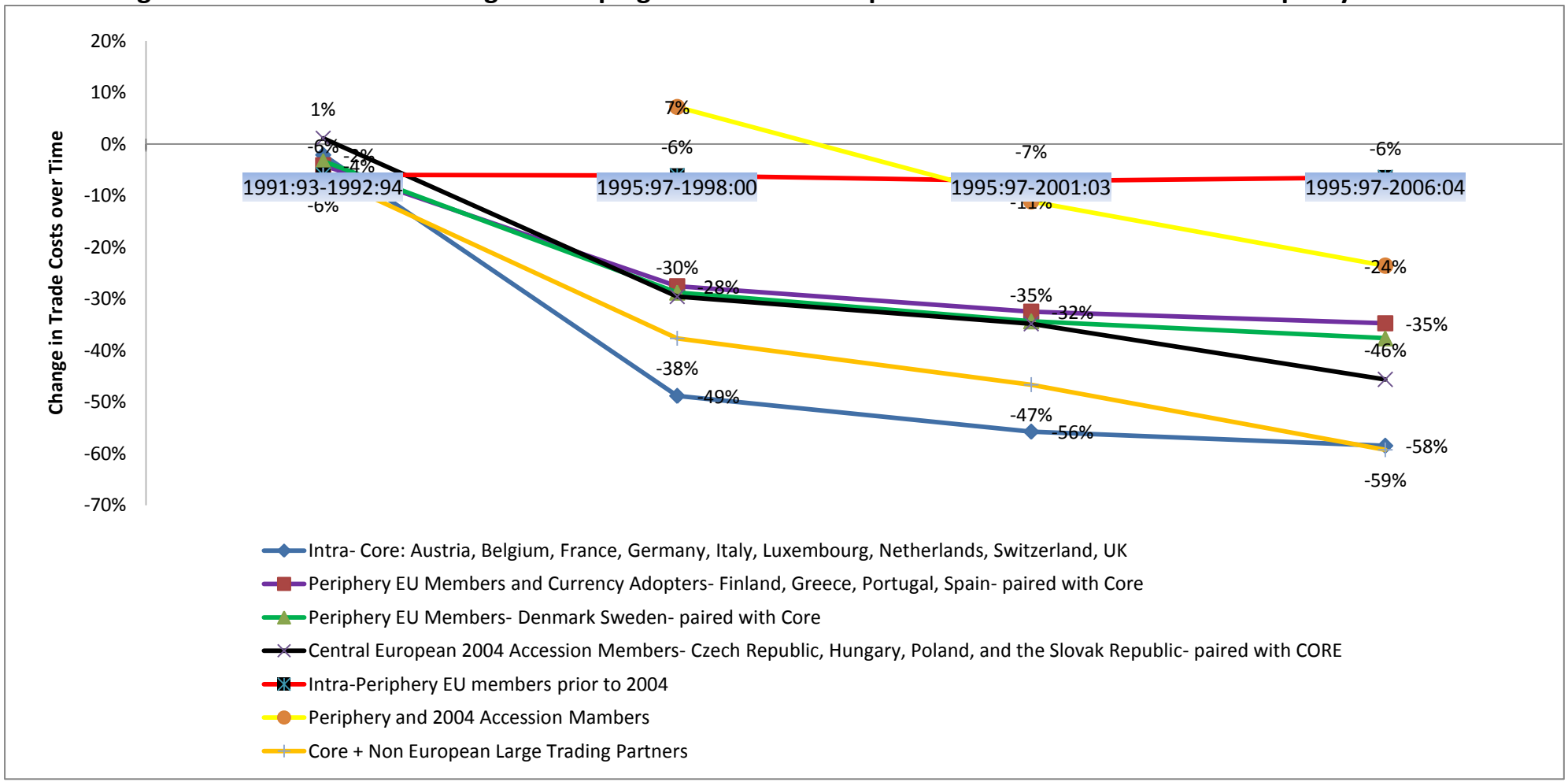


Figure 7: Trade Costs According to Groupings of Core and Periphery Countries in Western Europe



Key for Bilateral Trade Partners Represented	
1a	Core represents: Austria, Belgium, France, Germany, Italy, Luxembourg, Netherlands, UK
1b	Periphery: Finland, Greece, Portugal, Spain Switzerland
Two additional Core-Periphery Groups are used for comparison. The second Core Group is Core group 1a plus Switzerland. The third group is Core group 1a minus Italy.	

Figure 8: Trade Costs According to Groupings of Western European Countries in the Core or Periphery



Annex 1: EU Formation- Brief History of Key Dates

Date	Countries	Count of Countries who Join EU	Count of Countries in the Euro zone
Up until 1914	Denmark, Norway, Sweden had common currency but split at outbreak of WWI	0	
1951-1952	Inner Six- France, Italy, Belgium, Netherlands, Luxembourg, and West Germany	6 (Though this point in history Belgium, Netherlands, and Luxembourg were one entity as the Benelux Countries)	
1957	Rome Treaty		
1972	Norway referendum- No vote on EU	Notably Norway remains not a EU country	
1973	UK, Denmark, Ireland	9	
1981	Greece	10	
1986	Spain and Portugal	12	
1990	East Germany in reunification joined by default all international treaties of West Germany	12	
1992	Maastricht Treaty		
1992	Switzerland- No vote on EU	Though has a number of treaties in place including free movement of people.	
1995	Austria, Finland, Sweden	15	
2001-2002	The Euro was adopted by Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain		12
2004	Central Eastern European Nations who join the EU: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia, Malta, Cyprus	25	
2007	Romania and Bulgaria join the EU Slovenia adopts the Euro	27- Not Included	13
2008	Cyprus and Malta adopt the Euro		15
2009	Slovakia adopts theEuro		16

Due to available data eight countries who are members of the EU are not represented in this dataset including: 1). Ireland; 2). 2004 accession members: Estonia, Latvia, Lithuania, Slovenia, Malta, and Cyprus; and 3). 2007 accession members: Both Romania and Bulgaria.

Annex 2: Member States and Important Historical Dates of European Union Single Market Policy

Source: www.en.wikipedia.org