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The Effects of a Currency Union on Trade: The Case of the Euro-System

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THE EFFECTS OF A CURRENCY UNION ON TRADE:
THE CASE OF THE EURO-SYSTEM

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THE EFFECTS OF A CURRENCY UNION ON TRADE:
THE CASE OF THE EURO-ZONE

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Abstract

The decision of a preferential trading agreement (PTA) to form a currency union adds a new dimension to the debate over whether PTA's are a step forward or backwards in the quest for world wide free trade.

This paper looks at the effects the introduction of the euro has had on trade within the European Union (EU). Using trade data for the twenty-three industrialized countries as classified by the International Monetary Fund, ordinary least-squares was applied to a gravity model of bilateral trade. Independent variables included: gross domestic product (GDP), per capita GDP, a distance measure, adjacency, common language, membership in the EU, and membership in the euro-zone.

Parameter estimates show that membership in the Euro-zone increased trade nearly one and a half times over nonmembers. Tests on data from subsequent years will be needed before definite conclusions can be reached, but these initial results are consistent with other researchers.

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Abbreviations and Acronyms

ASEAN	Association of Southeast Asian Nations
Benelux	Belgium-Netherlands-Luxembourg free trade area
CAP	Common Agricultural Policy
DM	Deutsche Mark
DOTSY	Direction of Trade Statistics Yearbook
DSB	Dispute Settlement Body
EURATOM	European Atomic Energy Commission
EDC	European Defense Community
EEC	European Economic Community
ECSC	European Coal and Steel Community
EC	European Community
ECB	European Central Bank
EMCF	European Monetary Cooperation Fund
EMI	European Monetary Institute
EMS	European Monetary System
EMU	European Monetary Union
ERM	Exchange Rate Mechanism
ESCB	European System of Central Banks
EU	European Union
€	Euro - common European currency
FPE	Factor Price Equalization
FTA	Free Trade Area
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GNP	Gross National Product
H-O	Heckscher-Ohlin
IMF	International Monetary Fund
ITO	International Trade Organization
MECOSUR	Mecado Común del Sur (Market of the South)
MFN	Most-favored-nation
MTO	Multilateral Trade Organization
NATO	North Atlantic Treaty Organization
OECD	Organization of Economic Cooperation & Development
OEEC	Organization for European Economic Cooperation
OLS	Ordinary-Least-Square
PTA	Preferential Trading Agreement
TPRB	Trade Policies Review Body (of the WTO)
TRIP(s)	Trade-related Intellectual Property Rights
TPRM	Trade Policies Review Mechanism (of the WTO)
UK	United Kingdom
WTO	World Trade Organization

1.0 Introduction

1.1 The 'Question'

The introduction of the euro (€) as the common currency unit of the European

Union (EU), has added an element to the debate on the economic benefits of regional

trading agreements. In spite of being acknowledged as 'second-best' to unrestricted

world free trade, regional trading agreements have proliferated under the General

Agreement on Tariffs and Trade (GATT) in the post World War II (WWII) period.

Nearly a third of the post WWII trade agreements were reported to GATT in the period

1990 to 1994 (Frankel 1997).

Trade agreements follow a progression of arrangements from most-favored-nation

(MFN) through economic unions, of which a currency union is one manifestation. This

paper will look at how the introduction of the euro, as the common currency of the EU

has effected the patterns of trade both between the EU members and with the EU

members major trading partners. Applying ordinary least-squares (OLS) analysis to the

gravity model of bilateral trade, we will test to see if being a member of the Euro-zone is

an expedient to trade. [1] Data includes export value, gross domestic product (GDP),

population, and the bilateral distance between the principal cities of the twenty-three

industrialized countries as classified by the International Monetary Fund (IMF). Before

we look at the empirical evidence we will briefly review the history of free trade and the

economic benefits and shortcomings of both regional trading agreements and currency

unions. Following the analysis of the data we will look at the policy implications of our

findings.

1.2 Free Trade-a Historical Overview

The theory that the overall welfare benefits of free trade are greater than

protection is one of the most widely accepted economic propositions. From Adam Smith

to modern economists, free trade has survived continued scrutiny. A definition of 'free

trade' is in order. In the context of this paper, 'free trade' will mean the flow of goods

and services across nation boundaries without artificial restrictions. Thus, the price paid

by consumers and producers reflects the 'world' price. These prices reflect the relative

scarcity of goods and resources and allow consumers and producers to consider the

opportunity cost of economic activities.

Figure 1   *Welfare Effects of Free Trade*

a. US Bike Market   b. International Trade   c. Rest of the World's
                              in Bikes   Bike Market
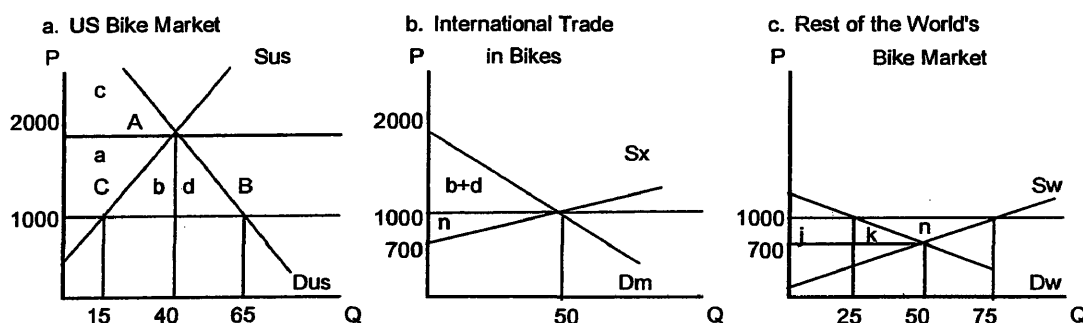
Welfare Effects of Free Trade

| | United States | | | Rest of World | |
Group	Surplus with Free Trade	Surplus with No Trade	Net Effect of Trade	Group	Net Effect of Trade
Consumers	a+b+c+d	c	a+b+c	Consumers	-(j+k) [a loss]
Producers	e	a+e	-a [a loss]	Producers	j+k+n
US as a whole	a+b+c+d+e	c+a+e	b+d	ROW	n

Source: Lindert and Pugel (1996)

It is easy to see graphically, as shown in Figure 1, that overall there is a gain in

welfare from free trade. US consumers gain an increased supply at lower prices and Rest

of the World producers gain increased prices for an increased volume of bikes.

Little in the way of a state policy towards trade was developed prior to Smith. Writers prior to the seventeenth century were more concerned with ethical and other related concerns. Economic issues were secondary considerations (Irwin 1996). Ancient writers and philosophers view of trade depended on their relationship to the sea and their view of it. Plutarch (100 AD) considered goods obtained through trade as beneficial to man (Irwin 1996). Horace (50 BC) viewed the sea as bringing unwanted contact with strangers (Irwin 1996). Generally, Greek and Roman philosophers were skeptical of merchants and traders.

Early Christians, following the lead of the earlier Greeks and Romans, viewed economics as a branch of ethics. Taking their cue from biblical text, they viewed merchants and traders as risking their souls with the temptations of covetousness, lying, cheating, and fraud. Irwin (1996) points out that although the Christians shared with the Greeks and Romans concerns with the moral aspects of trade, they were interested not in cultural autonomy but with spreading their religious and moral values around the world. In addition, the Christians distinguished between improving a good by adding value and merely selling the same good for a higher price.

Counter to the mistrust of trade and commerce by the Christian and Graeco-Roman thinkers, was the doctrine of universal economy. Developed by philosophers and theologians in the early centuries AD, the doctrine promoted the notion that resources and goods were distributed unequally around the world by Providence to promote commerce. Viner (1996) describes four elements to the doctrine: it embraces the stoic-cosmopolitan belief in the universal brotherhood of man; it describes the benefits of trade to mankind;

it recognizes that resources are unequally scattered around the world; and it attributes this arrangement to divine providence as a means of promoting trade and cooperation among men. Viner adds: " . . . the doctrine . . . has claims to be the oldest and longest-lived [economic] doctrine we know of. . ." (1991).

The doctrine of universal economy continued to be espoused to the case of free trade. Both mercantilists and free traders alike adopted it. The mercantilists, however, used it to promote their own particular point of view. It became a part of natural law teachings and those of the cosmopolitan doctrine of the enlightenment (Irwin 1996). Although the doctrine of universal economy clearly recognized the advantages of free trade, the non-economic effects of trade made free trade generally undesirable to most writers prior to the seventeenth century.

Medieval scholars continued to be skeptical of trade and commerce. Traders were generally connected to fraud and other sins because the pursuit of gain led to temptations that endangered one's soul (Irwin 1996). Individuals that produced goods from their labor were held in higher regard. St. Thomas Aquinas began the shift of recognizing the usefulness of traders and merchants to society. Although accepting the necessity of trade by recognizing that some goods and commodities could be produced more efficiently elsewhere, Aquinas felt that locally produced goods were superior because they promoted self-sufficiency. Goods that were in short supply, however, could be provided through trade.

Economic thought continued to evolve through the middle ages. Writers began to view commerce as an ethically neutral activity with only the potential for corruption.

Later theologians were divided on the issue. John Calvin recognized the benefits of trade but cautioned against its risks:

> " . . . as it most frequently happens that abundance leads to pride and cruelty . . . in that merchandise which is carried on with distant and foreign nations, there is often a large amount of tricks and dishonesty, and no limit set on the desire of gain."[2]

Martin Luther on the other hand held the view that countries should be more than content with domestically produced goods. Little good came of commerce he concluded.

Increased commercial activity in the seventeenth century necessitated the rethinking of philosophies on commerce. Building on Aquinas's concept of 'natural law', which used human reasoning to interpret the divine plan of what is right and wrong, the natural law philosophers prescribed a code of moral and judicial conduct that was proper in the pursuit of commercial activity. Applying 'natural law' to the relationships between states, the writers developed the 'law of nations'. Most endorsed the idea that because not all regions were endowed with equal resources, trade was necessary and states could not restrict trade. In the event that one nation restricted trade, others had the right to go to war to secure free access. As the 'law of nations' evolved it was applied to exceptions regulating trade. The right of nations to trade was transformed to the right of nations to regulate their trade.

Contemporary to the 'natural law' writers were the mercantilists. Rather than being theologians and philosophers, the mercantilists tended to be merchants, government officials, and other individuals who were interested in promoting a cause for their own personal gain. The mercantilists wrote at a time, the sixteenth and seventeenth centuries, that saw vast expansion of overseas trade and exploration and the rise of nation-states as

political entities (Irwin 1996). Most mercantilist literature was in the form of pamphlets, with English writers being the most prolific and pertinent to trade issues. The mercantilists were primarily interested in maintaining a favorable balance of trade, believing that the wealth of a nation was measured in its holdings of specie (gold and silver).

Specie was necessary for making the transactions involved in trade and as security in times of war. Consequently a favorable balance of trade, where exports exceeded imports, meant that a nation would be accumulating stocks of specie. By extension, it was advantageous to protect import competing industries and commodities with tariffs and provide state assistance to exporting industries. Domestic commerce was often dismissed as not contributing to the wealth of the nation. While domestic trade only enriched the individuals involved, foreign trade increased the nations wealth.

The emergence of the nation-state brought political boundaries to trade policy. The mercantilists framed their debate in the context of political and economic rivalries. Trade was carried on in the framework of a fixed volume of trade. One country benefited at the expense of another. Mercantilists advocated the regulation of trade that benefited the nation particularly if the regulation benefited the industry in which the writer was involved!

Gradually, the necessity for two-way trade began to be recognized. If an importing country couldn't in turn sell its goods abroad how could it buy another country's goods? By the end of the seventeenth century, doubts were raised about a positive trade balance being a good measure of winning or losing at trade (Irwin 1996).

It became a common mercantilist theme to advocate policies that promoted the exportation of manufactured goods and the importation of raw commodities. A commercial policy began to develop that placed high import duties on manufactured goods and low duties on raw materials. Mercantilists supported commercial (economic development) policies that promoted manufacturing.

Free trade thought began to emerge as a challenge to the goals and concerns of the mercantilists and to question the role of the state in economic affairs and international trade in particular. Principal among the eighteenth century writers was Adam Smith. His *An Inquiry into the Nature and Causes of the Wealth of Nations* published in 1776,[3] was one of the first comprehensive and certainly most notable works on economic thought. Smith was able to " . . . present a systematic, coherent framework for thinking about the economics of trade policy" (Irwin 1996).

The bulk of Smith's writing on trade policy is in Book IV, "Of System's of Political Oeconomy." Smith identified the object of mercantilist policy as " . . . to diminish as much as possible the importation of foreign goods for home-consumption, and to increase as much as possible the exportation of the produce of domestick industry" (IV.i.15). Smith was interested in the economy wide impact of commercial policy. While acknowledging that the mercantilist policy of protecting domestic manufactures via tariffs encouraged expanded domestic production, Smith theorized that " . . . whether it tends either to increase the general industry of the society, or to give it the most advantageous direction, is not, perhaps, altogether so evident" (IV.ii.2).

Smith framed his argument around the notion that: "Every individual is continually exerting himself to find out the most advantageous employment for whatever capital he can command. It is his own advantage, indeed, and not that of society, which he has in view. But the study of his own advantage naturally, or rather necessarily leads him to prefer that employment which is most advantageous to society" (IV.ii.4). [Smith's 'invisible hand' (IV.ii.9).]

Smith argued the importance of assessing the 'opportunity costs' or trade off between alternative policies. Government regulation " . . . can only divert a part of it [societal capital] into a direction into which it might not otherwise have gone; and it is by no means certain that this artificial direction is likely to be more advantageous to the society than that into which it would have gone of its own accord" (IV.ii.3).

Applying these ideas to trade policy, Smith reasoned that a society was best served by employing its resources in ways in which it was at an advantage and trading another country for those goods in which it had an advantage. "If a foreign country can supply us with a commodity cheaper than ourselves can make it, better buy it of them with some part of our own industry, employed in a way in which we have some advantage" (IV.ii.12).

Smith concluded that mercantilist policy, although encouraging domestic economic progress, diminished national welfare with distorted economic policies that misallocated resources. National welfare was best served by policies, including trade, which allowed individuals to direct their efforts to their own advantage.

The *Wealth of Nations* was followed in the early nineteenth century with a plethora of works by a group of intellectual economists known as the classical economists. Writers such as James Mill (1773-1836), David Riccardo (1772-1823), Robert Torrens (1818-84), Robert Malthus (1766-1834), J. B. Say (1767-1832), James Stuart Mill (1806-1873), and Nassau Senior (1790-1864) expanded on Smith's ideas.[4]

Ricardo is credited with developing the theory of comparative costs and was a chief opponent of the British Corn Laws.[5] Mill staunchly advocated free trade (Irwin 1996). J. S. Mill, James Mill's son, argued against protection for domestic producers and illustrated the increased welfare effects with international specialization and trade. Malthus famous for his views on population joined the debate on the Corn Laws opposite Ricarrdo. Torrens, along with Mill, saw the advantage of letting trade determine the most efficient use of resources.

Support for free trade in the early part of the nineteenth century was not unanimous. As noted above, Malthus advocated an agriculture policy that protected agriculture and the British land owning class. Other writers found exceptions to unilateral free trade. Torrens modified his position of advocating free trade to one in which a country was justified in imposing a tariff to equalize the terms of trade between two countries. Torrens's arguments elicited considerable debate from most of his contemporaries, principally Nassau Senior.

J. S. Mill brought support to Torrens' argument in his *Essays on Some Unsettled Questions of Political Economy*. Mill, as well as Torrens, acknowledged however that while improving a country's terms of trade, import tariffs reduced world welfare overall.

Additionally, Mill gave qualified support to the 'infant industry' argument (1848).[6]

Mill's position elicited considerable criticism from his contemporaries. Alfred Marshall

(1842-1924), considered one of the leading economists of the next generation, added

credibility to the infant industry argument by writing: " . . . protection to immature

industries is a very great national good . . ." (1903). The infant industry argument was

used well into the twentieth century as justification for the imposition of tariffs (Irwin

1996).

A final assault to free trade thinking from an influential economist came from

John Maynard Keynes. Writing in the context of the collapse of the world economy in

the 1930's, Keynes advocated using import tariffs as a means of stimulating domestic

production and relieving high unemployment. Initially a free trader, Keynes modified his

views in an attempt to relieve chronically high rates of unemployment in 1920's Britain.

British monetary policy at the time tied sterling to gold. British producers, exporters and

import-competing, were at a competitive disadvantage. The tight monetary policy of the

British government depressed domestic output and employment (Irwin 1996).

Keynes proposed several solutions to combat the economic crises that became the

Great Depression, among which was the call for import tariffs. This seemed the most

feasible since other policy measures were deemed too impractical. Although believing

that protectionist policies would be harmful in the long run, the worsening crises

convinced Keynes that protectionist measures should be implemented (Keynes 1981).

Keynes saw three remedies for increasing employment and business activity: devaluation,

nominal wage reductions, and import tariffs.

Keynes' proposals were met with considerable criticism. Lionel Robbins, a fellow member of the Economic Advisory Council to the British government was sharply critical and maintained that a tariff would not alleviate unemployment and would incite foreign protectionists (Hoekman and Kostecki 1996). Keynes stature as an economist lent legitimacy to protectionist policies up until the 1970's when stagflation proved Keynesian policies ineffective. [7]

The end of WWII brought a different perspective to the free trade argument. At the end of the war policy planners set about establishing mechanisms that would help prevent breakdowns in the world economic structure such as those that led to the Great Depression and WWII.

1.3 GATT & WTO

One of those mechanisms was the General Agreement on Tariffs and Trade (GATT). Established in 1947, the GATT was to be a forum in which trade disputes could be resolved before they escalated into full fledge trade wars. The GATT was an interim agreement reached by negotiators after the US failed to ratify the more formal International Trade Organization (ITO). The GATT had no institutional structure but was an inter-governmental treaty (Hoekman and Kostecki 1995). The goal of the GATT was to raise standards of living, ensure full employment, develop the full resources of the world, and expand the production and exchange of goods. Furthermore, it was a goal to reduce, in a mutually agreeable and advantageous manner, tariffs and other barriers to trade.

By the 1990's the GATT had evolved into a *de facto* world trade organization with a complex set of codes and arrangements, interpretations, waivers, reports and Council of Representative decisions (Hoekman and Kostecki 1995).[8] Technically, the GATT Secretariat came under the auspices of the United Nation.

Eight rounds of negotiations were held under GATT: the Geneva round (1947), the Annecy round (1949), the Torquay round (1951), Geneva again in 1956, the Dillon round (1960-61), the Kennedy round (1964-67), the Tokyo round (1973-79) and the Uruguay round (1986-94). The first five rounds dealt with tariffs. With the Kennedy round, attention shifted to non-tariff restrictions and agricultural trade. The Tokyo round dealt with product standards and government procurement, issues not subject to GATT. The Uruguay round expanded to include trade in services, intellectual property, and rules of origin (Hoekman and Kostecki 1995).

In 1990, Canada, backed by the EC, proposed a Multilateral Trade Organization (MTO). A single body with an institutional framework was needed to encompass all agreements and arrangements concluded to that point as well as to include the General Agreement on Trade in Services (GATS) and Trade-related intellectual property rights (TRIPs).[9] Originally opposed by the United States, the World Trade Organization (WTO) became a formal institution in 1995. There was little change in the *status quo* from GATT since most of the institutional framework already existed. The WTO has equal status with the IMF and World Bank.

The WTO has five functions: facilitating the implementation and operation of the Multilateral Trade Agreements; providing a forum for the negotiations on already

covered or new issues; administering the Understanding on dispute settlement and the

Trade Policies Review Mechanism (TPRM); and co-operating with World Bank and the

IMF to achieve greater coherence in global economic policy making (Hoekman and

Kostecki 1995).

The WTO provides a framework for the settlement of trade disputes. Although

largely codifying existing GATT practices the WTO provides a more timely, automatic

and binding mechanism. Disputes not resolved through direct negotiations between

contending parties can be brought before a panel of the Dispute Settlement Body (DSB).

Appointed by the WTO Secretariat, the three member panels gather information from the

disputing parties and make a recommendation to the DSB. If the offending country fails

to enact the recommendations of the DSB in a 'reasonable period of time', the

complainant can suspend concessions or retaliate (Hoekman and Koestecki 1995). From

1948 to 1990, of the 120 disputes brought to GATT, 60 led to panel reports and of those

60, only four were not adopted (Hoekman and Kostecki 1995). The WTO should have at

least as good a track record if not better.

In spite of compelling evidence in support of free trade and the gains made under

the GATT, free trade and the WTO are not without their distracters. In November of

1999, opponents of free trade and the WTO virtually shut down what was to be the

opening of a new round of negotiations. Protesters of various persuasions disrupted

ministerial level negotiations that were to address issues left over from the Uruguay

round, mainly agriculture and services. The WTO is seen as an agent for big companies'

global ambitions at the expense of jobs and the environment (The Economist 1999).

2.0 Literature Review

2.1 Preferential Trading Agreements

In spite of economic evidence that they are a 'second-best' alternative to free trade, the number of preferential trading agreements (PTA), subject to GATT Article XXIV grew from one in 1947 to more than 100 in 1994 (Baghwati and Phangariya 1996).[10] At the same time, ad valorem (percent of value) tariff level fell from 40 percent in 1948 to around 3 percent in 1998 (Freund 1998). Researchers have extensively explored the economics and politics of PTA's. Conclusions vary.

PTA's take many forms from most-favored nation (MFN) to full economic integration. Most-favored-nation agreements are special trade concessions granted to a trading partner that are equal to agreements with a third nation. MFN arrangements as formal trade policy can be traced to the beginning of the nineteenth century (Promfret 1997). The GATT established MFN as a basic policy subject to exceptions of Article XXIV. Other arrangements are: free trade areas (FTA) where members grant 100% reciprocal tariff reductions to each other member while retaining discriminatory tariffs against non-members; customs unions set a common set of trade policies towards non-members; a common market expands the free movement of goods and services to include factors of production (labor and capital); and an economic union seeks to coordinate economic policy including monetary and tax policy.

The welfare implications of PTA's are subject to debate. Krugman (1991) demonstrates with a simple numerical example that PTA's can be either welfare reducing or welfare increasing depending on the starting point of the member countries (Box 1).[11]

Box 1: A Hypothetical Example of A Free Trade Area

Imagine that country **A** can produce wheat for itself, import it from **B** or import from **C**. The cost of producing a bushel of wheat in **A** is 10. The cost of wheat bought from **B** is 8. And the cost of wheat bought from **C** is 5.

	Tariff Rate		
	0	**4**	**6**
Cost of Wheat From:			
A	10	10	10
B, before customs union	8	12	14
B, after customs union	8	8	8
C	5	9	11

Suppose initially that A has a tariff that applies to all imported wheat. If it imports wheat in spite of the tariff, it will buy it from the cheapest source, **C**. This case is illustrated by column Tariff Rate = 4. If the tariff is high enough, i.e. Tariff Rate = 6, A will grow its own wheat.

Now suppose that **A** enters a custom union with **B**, so that wheat from **B** can enter free of tariff. Does this increase **A**'s welfare or not?

If the tariff was initially 6, the customs union is a good thing. **A** will replace its expensive domestic wheat, priced at 10 for cheaper wheat from **B** (8). It can then use its resources to produce those things in which it is most productive. If, however, the tariff was initially 4, the customs union will cause **A** to shift from importing from **C** the low cost producer to higher priced wheat from **B**. In which case, welfare may be reduced by the customs union.

Source: Krugman (1991)

A similar result can be demonstrated graphically. Following Bhagwati and Panagariya (1999), the potential for a PTA to be either welfare increasing or reducing is shown in Figure 2. For three countries, A, B, and C, A and B are potential union partners and C is any third country with which A trades. In 2a. and 2b., $M_a M_a$ represents A's import demand for some product or commodity. $P_b X_b$ and $P_c X_c$ represents the supplies
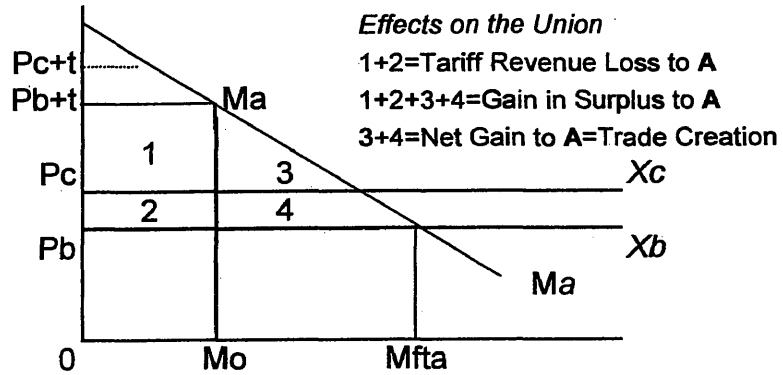
(export) of the same product available from *B* and *C* respectively. In 2a., the price of B, P_b is less than that of C, P_c. In 2b., the opposite is true. In both cases, following Viner's partial equilibrium, model prices are considered constant.

Figure 2a. illustrates the case of a trade-creating union with a non-discriminatory tariff *t*. A imports quantity OM_o of the product. All imports come from B, the low cost producer, so that A raises areas 1+2 in tariff revenue. A now forms a PTA with B. Imports increase from OM_o to OM_{fta}. The tariff revenue to A is now gone, but the price to consumers in A drops by *t*. A's consumers gain the entire surplus. The union acts like non-discriminatory free trade and A and the union has a net gain in trade represented by areas 3 and 4.

Figure 2b. illustrates a trade-diverting union. In this case P_b is higher than P_c. With tariff, *t* in A all imports come from C. A imports OM_O and collects tariff revenue shown by areas 1 and 2. When A and B form a PTA imports expand to OM_{fta} but all supply switches from C to B. Some trade is created by the lowering of the price to A's consumers, but the switch to the higher priced producer from C causes trade diversion of MO_o from C to B. The gains to A are shown by area 3 and the losses by 2. Unless the price difference between B and C is small the welfare loss to A will exceed any gains from the trade created. The gains to a country from increased trade can be substantial. Estimates by Frankel and Rose " . . . suggest that every one percent increase in trade (relative to GDP) raises income per capita 1/3 of a percent over a 20-year period, and substantially more over the long run" (2000).

Figure 2

2a. Trade-creating Union of **A** and **B**

Pc+t
Pb+t Ma
Pc 1
2 3
Pb 4
Xc
Xb
Ma

0 Mo Mfta

Effects on the Union
1+2=Tariff Revenue Loss to **A**
1+2+3+4=Gain in Surplus to **A**
3+4=Net Gain to **A**=Trade Creation

2b. Trade-diverting Union of **A** and **B**

Pb+t
Pc+t Ma
1 3
Pb 2
Pc
Xb
Xc
Ma

0 Mo Mfta

Effects on the Union
1+2=Tariff Revenue Loss to **A**
1+3=Gain in Surplus to **A**
3-2=Gain or Loss to **A**=Trade Gain or Loss
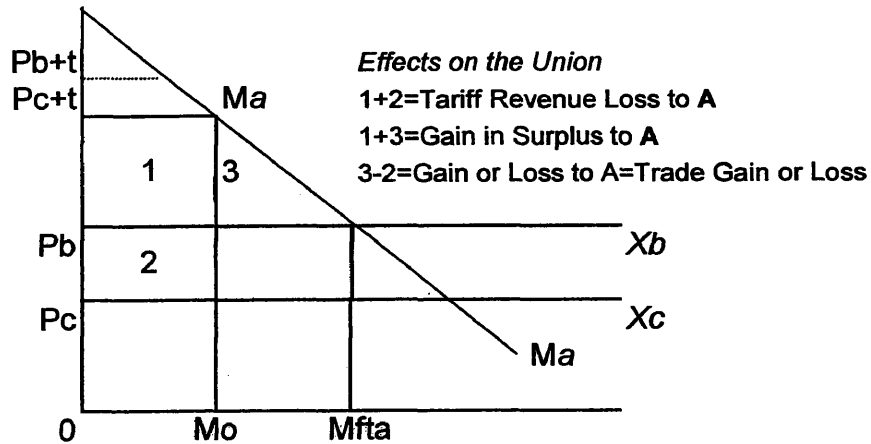
Source: Bhagwati and Panagariya (1999)

If evidence proves the welfare-reducing nature of discriminatory trade practices and the GATT and now WTO provide a forum in which to resolve trade disputes why have they continued to proliferate? Pomfret (1997) offers four explanations: extension of non-discriminatory trade arguments, bargaining motives, political motives, and gains to exporters.

Several of the arguments in support of non-discriminatory trade policies can be adapted to discriminatory practices. First, a large country can use its market share to improve its terms of trade by imposing import restrictions. A large country may be able to implement discriminatory tariffs depending on the elasticities of its importers. By doing so it will be able to increase revenues above that of a single optimum tariff.

The possibility of increased tariff revenue is another argument used in support of PTA's. The increase in the geographical size of a trading area may increase the administrative costs of trade as well as the GNP of the combined area. The larger area initially may see a rise in their tariff revenues. Tariff revenues appear to decline over time, however (Pomfret 1997).

The protection of domestic industry is viewed as the primary motive for establishing a PTA. If foreign producers are seen as an industry's primary competitors, then import restrictions are seen as an effective way of securing an advantage to domestic producers. Alternative sources or comparable substitutes, however, soon render the restrictions ineffective. Still, countries are able to negotiate bilateral trade agreements under GATT and can target specific industries. An extension of this argument is to protect an 'infant industry'. As discussed above, the infant industry argument has long been a point in the free trade debate. Countries at a competitive disadvantage in the market often choose to protect an industry until it can 'mature' either through economies of scale or efficiencies gained through experience. Competition, not protection, over time is usually the best means of increasing efficiencies. Protected industries want to remain protected.

Additionally, during the 1980's the argument was made that protecting domestic firms was a way of increasing their market share against monopolistic competition. Finally, national security is often used as a reason to protect certain suppliers or industries. This part of the argument can be extended to regional security arrangements, as well.

Another main argument for discriminatory trade practices is the gains to the protected exporters. In reciprocal arrangements like a customs union, each member will be a favored exporter of something and the union's terms of trade will increase in relationship to the rest of the world.

Next, if a country's tariff levels are independent of another country's tariffs, a country has an incentive to level an optimal tariff. The bargaining strength of a country depends on its optimum tariff level. The higher the optimum rate the more interested a country's trading partners will be in negotiating to keep the tariff below the optimum rate (Pomfret 1997). Bargaining by a large country offering special treatment to a small country is likely to be the most successful.

Lastly and probably most importantly, are the political motivations of trade policies. Discriminatory trade policies alter the patterns of trade, resulting in gains to the favored and losses to the discriminated against. The formation of the EC was a political exercise with the customs union effects as reinforcement.

Large countries are more likely to use political motives in granting preferential treatment to smaller countries. The economic gains to large country may be small but they could be significant to the smaller country. Political motives most likely are to gain

or maintain a sphere of influence within a region. Trade policy becomes foreign policy. Sanctions are sometimes used as a foreign policy tool. However, sanctions are rarely effective. Trade considerations seldom influence an entrenched government (Cuba for example) and sanctions give rise to free-riders taking advantage of the increased favorable terms of trade and finding ways to skirt the blockade.

Other considerations, other than those suggested by Pomfret, for the formation of PTA's are geographical proximity and historical trade patterns. The cost of trade between neighbors is often lower due to decreased transportation costs. Familiarity with products and customs are also incentives to do business. Regional cooperation then becomes attractive. Historical connections such as colonial influences are often used to explain trade patterns (Rose 2000).

What influence does membership in a PTA have on the pattern of trade? Studies abound.[12] Frankel (1997) finds that for the EU, members trade 35% more than similar non-members. For other blocs such as NAFTA, Frankel (1997) shows a coefficient of 0.36 for a 43% increase in trade ($e^{0.36} = 1.43$). For MECOSUR,[13] the coefficient was 1.92 in 1990 (Frankel 1997, Table 4.2) for an almost seven ($e^{1.92} = 6.81$) times increase in trade. Two Association of Southeast Asian Nations (ASEAN) countries trade six times ($e^{1.77} = 5.85$) more than two similar non-Asian countries (Frankel 1997, Table 4.2).[14] Freund (1998) found that EU members traded one and a half times ($e^{0.42} = 1.52$) more with each other in 1990 than with non-members. Generally, membership in a PTA has a positive influence in trade volume between members. The magnitude being a function of varying factors.

2.2 The European Union

All of which brings us to a discussion of the EU,[15] the PTA that is the focus of our study. The years immediately following WWII saw a concerted effort by Western Europe towards cooperation. Spurred on by the United States to equitably distribute the aid from the Marshall Plan and by the military threat posed by the Soviet Union, Western Europe began to take the steps that led to the EU. The need to resolve the 'German problem' also played a role in European cooperation.

The Organization for European Economic Co-operation (OEEC) was set up in 1947 to distribute the Marshall Plan aid. Although the aid program was over in three years, the OEEC proved to be a forum in which to discuss economic co-operation and trade issues. The OEEC was expanded in 1961 to include all advanced non-communist industrialized nations, becoming the Organization for Economic Co-operation and Development (OECD).[16] In reaction to the take over of Czechoslovakia by the Soviet Union in 1948, the United Kingdom (UK), France, Belgium, the Netherlands, and Luxembourg formed the Western European Union (WEU). Largely superceded by the North Atlantic Treaty Organization (NATO), the Treaty of Brussels called for collaboration in economic, social and cultural matters and for collective self-defense.

The disastrous effects of the isolation of Germany following WWI could not be repeated. The desire to keep Germany in a perpetual state of economic backwardness was overruled by the need to use Germany (West Germany at least) as a buffer to the expanding Soviet Union. The solution was to intertwine Germany so intrinsically with its neighbors that another European war would be impossible. Europe would gain not only a

German military presence for the defense of Europe but Germany's natural resources would be available to a recovering Europe.

Conflict between France and Germany over the Saarland, the rich iron and coal region of Germany led to the formation of the European Coal and Steel Community (ECSC). Italy and the Benelux Union joined France and Germany in the 1951 Treaty of Paris.[17] The UK was notably absent from the ECSC having been invited to join but declining membership. The six ECSC members formed the European Defense Community (EDC) in 1952,[18] but the French National Assembly failed to ratify the treaty. In 1957, the six ECSC countries signed treaties in Rome to establish the European Economic Community (EEC) which was to establish a common market and the European Atomic Energy Commission (Euratom). The three-ECSC, EEC, and Euratom-joined in 1967, to form the European Community (EC). Strongly influenced by the French president Charles de Gaulle and West German chancellor Konrad Adenauer, the EC got off to a great start. Intra-community trade increased an average of 28.4% annually for the first ten years (Leonard 2000). The goals of removing internal tariffs and the establishment of a common external tariff were met ahead of schedule. In addition, a common agricultural policy (CAP) was adopted in 1962. De Gaulle had effectively blocked entry into the EC by the UK, considering the UK's first priorities were to the United States, but after his death in 1970, Denmark, Ireland, and the UK gained membership to the EC in 1972. Norway narrowly rejected accession in 1972. Greece entered the community in 1981 with Portugal and Spain joining in 1986.

The European Monetary System (EMS) became effective in March of 1979. The EMS was established as a means of stabilizing currency fluctuations within the EC. Additionally, membership in the EMS provided other benefits. A stable currency removes much of the uncertainty in cross border transactions. Johnson (1998) estimates a savings of 0.3% of GDP in transaction costs with the single currency. Reducing and controlling inflation is another benefit to membership. Stable prices help countries maintain competitiveness. Investors are more willing to invest if they are assured the value of their investments will be maintained.

The European Monetary Co-operation Fund (EMCF) and a common currency unit (the ecu) backed the exchange rate mechanism (ERM) of the EC. Under the ERM, each participating currency (of the nine members only the UK opted out) had an exchange rate pegged to the ecu. A currency could be realigned (given a new rate) by mutual agreement of the participating countries if it stayed too long at a 'ceiling' or 'floor' level. Bilateral rates were then calculated around the central rate. Currencies were allowed to fluctuate +/- 2.5 % around the central rate (Leonard 2000).

In 1992, the Maastricht Treaty was signed transforming the EC into the European Union (EU).[19] The Maastricht Treaty set up a timetable for achieving economic and monetary union and set up the protocol for the establishment of EC institutions. Once again the UK opted out.

In 1995, Austria, Finland and Sweden became full members of the EU. By this time it was apparent that the EU was on track to implement its plan of a single currency.

January 1, 1999 was set as the target date. Convergence requirements for accession to the Euro-zone are:

♦ A country's inflation rate should, over the previous year, not have exceeded by more than 1.5% that achieved by an average of the three best performing states.

♦ Its currency had been in the narrow band of the ERM for at least the preceding two years and had not been devalued during that period.

♦ Its long-term interest rates had not exceeded by more than 2% over the preceding year the average of the three best-performing states so far as price stability is concerned.

♦ It was not subject to a decision of the council that it was running an excessive budget deficit (Leonard 2000).

Of the EU-15, Greece and Sweden were excluded from the single currency because of its failure to meet the requirements of the Maastricht Treaty and the UK and Denmark opted out. As of January 1, 1999, the euro became operational. Coins and currency won't be issued until 2002 when the national currencies will be withdrawn.

In 1999, the EC-15 had a combined population of 375 million with GDP of $8,491 billion. Its 1999 export volume was $432.2 billion of which 79% was intrabloc. The EU-15 is the second largest economy in the world after the US. Table 1 illustrates the importance of trade to the EU.

Table 1   % Trade EU and Industrialized Countries

	1987	1992	1997	1999
% of Trade EU to Industrialized Countries	81.6	77.5	76.4	79.0
% of Trade Industrialized Countries to World	76.3	74.0	70.0	72.9

2.3 Currency Unions

The establishment of a currency union between two countries or by a PTA adds a new factor to the equation of international trade. For the purposes of this project, a currency union will mean an agreement between two or more countries to share a common currency. Other exchange rate mechanisms such as pegging and currency boards, although designed to minimize exchange rate fluctuations, are less stringent than sharing a common currency. Sharing a common currency implies sharing a common monetary policy as well. In addition to the Euro-zone, Rose (2000) identified 92 countries belonging to seventeen currency unions in the period 1970-1990. Twenty-nine of the 92 countries are dependencies or territories. Most currency unions involve small countries. The Euro-zone is unique in that it involves a group of industrialized countries.

Why establish a currency union? Proponents tout benefits such as increased central bank credibility, inflation control, and expanded capital markets. All of which tend to raise productivity and output. Without question increasing trade is a primary motive. Undeniably, a single currency facilitates trade by reducing transaction costs. Increased trade has a number of ramifications: synchronization of business cycles, increased competition for factors of production, a general strengthening of political ties, and of course greater consumer welfare inside the union (Rose 2000).

Economic studies have found little effect on trade from reduced exchange rate volatility (Rose 2000).[20] Critics of single currency areas point out that most exchange rate risk is accounted for by the use of forward contracts. Therefore, the main argument for a single currency, that of eliminating exchange rate fluctuations, is irrelevant. Few studies exist, however, that have looked at the effects of a currency union on trade (Frankel and Wei 1998; Frankel and Rose 2000; and Rose2000). Rose (2000) and Frankel and Rose (2000) both found that membership in a currency union increased intra-union trade by three times.

Mancera (1991) differentiates between the general characteristics of several types of currency areas. First, there is a currency union in which a country or countries peg their currencies to that of a reference currency. This is usually informal and unilateral. Several advantages arise to the country that pegs its exchange rate to a reference currency. Certain conditions need to be met: the referencing countries purchasing power should be relatively stable; prices and income (real and nominal) should be flexible; the reference country is a major trading partner or the pegging country uses the reference currency in most of its international transactions; there are no serious obstacles to international merchandise movements; the pegging country is not overly exposed to external shocks; and finally maintaining the peg is an actual possibility.

Given the reference currency's stability and the pegs sustainability, the pegging country can expect several benefits: the country's inflation rate should converge to that of the reference currency; the risk in international transactions should be reduced which in turn increases economic certainty and confidence, both ingredients in economic growth.

A second type of currency area is one in which exchange rates are fixed or allowed to fluctuate within a band by treaty. The rates are revisable and backed by a system of reciprocal credit. The European Monetary system's ERM was such a regime. In exchange for the loss of exchange rate flexibility, member countries gain the combined credit resources to support their exchange rates in cases of temporary disequilibria. Coordinated fiscal and monetary policies further increase stability.

Closer policy coordination is required by exchange rate regimes in which rates are permanently fixed. This type of currency area requires virtually the same policy coordination that would be required by adopting a single currency. However, since domestic currencies would continue to circulate, some of the efficiencies of a single currency would be lost.

Finally, there is the currency area, such as the Euro-zone, in which its members adopt a single currency. There are profound implications to the adoption of a single currency. It is necessary for the member countries to cede their monetary authority to an independent central bank. As discussed below, monetary and fiscal policy tools are lost to individual members. On the other hand member states gain the combined credit resources of the union, savings in transaction costs and unfettered access to a larger market.

Critics counter that a single currency is not the cure all. A single currency among dissimilar economies removes numerous tools from policymakers' toolboxes. A shared monetary policy curtails an individual member country from responding to economic conditions unique to it. Demand shocks must be similar and factors of production need to

be highly mobile between countries of a currency zone. Exchange rate flexibility, which is lost in a currency zone, is another policy tool that is viewed as necessary for responding to changes in economic conditions. Additionally, political questions must be answered. For example, how much independence should a central bank have? What form of governance should it have? To whom is it accountable?

2.4 The European Monetary Union

The EMU's transformation to a single currency union has been guided by institutions and policies set in place by the Maastricht Treaty. The *Protocols on the Statue of the European System of Central Banks and of the European Central Bank* went into effect on November 1, 1993.[21] In order to conduct the single monetary policy and for the creation of a single currency, the European Monetary Institute (EMI) was established. Its goal was to strengthen central bank cooperation and monetary policy coordination and to make the preparations required for the establishment of the European System of Central Banks (ESCB). With the appointment of the President, Vice-President and four members of the Executive Board of the European Central Bank (ECB) on June 1, 1998, the ECB was established and the EMI ceased to exist. On January 1, 1999 the exchange rates of the eleven EMU states that met the convergence criteria were fixed and a single monetary policy became the responsibility of the ECB.

The main objective of the ECB is price stability. This is to be accomplished by defining " . . . a prominent role for money, as signaled by the quantitative reference value for the growth of a broad monetary aggregate; and a broadly based assessment of

the outlook for price developments and risks to price stability in the euro area as a whole" (ECB 2001a).

In addition, the ESCB or Euro-system is:

♦ to define and implement the monetary policy of the euro area;

♦ to conduct foreign exchange operations;

♦ to hold and manage the official foreign reserves of the Member States; and

♦ to promote the smooth operation of payment systems (ECB 2001b)

Table 2	Conversion rates for the euro	
€ 1=	13.7603	Austrian schillings
	40.3399	Belgian francs
	40.3399	Luxembourg francs
	1.95583	German marks
	166.386	Spanish pesetas
	5.94573	Finnish markkaa
	0.7877564	Irish pounds
	1,936.27	Italian lire
	2.20371	Dutch gilders
	200.782	Portuguese escudos
	340.750	Greek drachma

Source: Leonard (2000); ECB (2001)

How can the benefits of membership in a currency union be measured? The gravity model of bilateral trade has demonstrated its reliability in predicting trade flows and the effects of various factors on the volume of bilateral trade. This model will be applied to determine what influence membership in the euro-zone has on trade.

3.0 Empirical Data and Method

3.1 The gravity model of bilateral trade

The gravity model of bilateral trade provides the framework for analyzing the data. In its most basic form, $X_{ij}=a_0 Y_i^{a1} Y_j^{a2} D_{ij}^{a3}$ the gravity model says that the volume of trade (X_{ij}), between country i and country j is proportional to the product of GDP_i (Y_i) and GDP_j (Y_j) and to the distance (D_{ij}) between them. Any number of other explanatory variables can be added, such as measurements in size: population or per capita GDP as in this project, and land areas. Additionally, dummy variables that measure geographical or cultural similarities, such as common language, colonial relationships, common borders, or membership in regional trading agreements are often included.

The model for this project transformed to log form for OLS analysis is specified by the following equation:

$$\log(X_{ij}) = a + \beta_1 \log(GDP_i \, GDP_j) + \beta_2 \log(GDP/pop_i \, GDP/pop_j)$$
$$+ \beta_3 \log(DIST_{ij}) + \beta_4 (ADJ_{ij}) + \beta_5 (LANG_{ij})$$
$$+ \gamma_1 (EU_{ij}) + \gamma_2 (CR_{ij}) + \gamma_3 (EURO_{ij}) + e_{ij} \qquad (1)$$

The variables are defined as follows: X_{ij} is the value of exports from country i to country j measured in millions of US\$; GDP is gross domestic product, measured in billions of US\$; POP is population in millions; DIST is the great circle distance between the major cities in i and j in miles. ADJ is a dummy variable indicating common borders. 1 if i and j share a common border, 0 otherwise. LANG is a dummy variable denoting a common language. 1 if i and j share a common language, 0 otherwise. CR, EU and EURO are dummy variables representing membership in a common geographical region, the EU and Euro-zone respectively. 1 if a member, 0 otherwise. e is an error term.

The gravity model of bilateral trade has gained recent credibility in international economics. Frankel (1997) gives three reasons for the model's revival: its empirical success at predicting trade flows; modern theories of trade in imperfect substitutes supporting its theoretical foundations; interest by economists in the role of geography and trade. Early applications of the model to trade flows were done by Tinbergen (1962) and Pöyhönen (1963). Linnemann (1966) added extensively to Tinbergen with the addition of more variables.

Frankel (1997) credits regional economists and urban sociologists with using the model by name as far back as 1946. Frankel (1997) goes on to equate the trade model to Isaac Newton's gravitational model which states 'the attraction between two heavenly models is proportional to the product of their masses and inversely related to them'.

3.2 Theoretical Foundations

Tinbergen (1962) and Pöyhönen (1963) applied early versions of the gravity model to bilateral trade flows. Linnemann (1966) expanded on Tinbergens model by adding more variables. The gravity model owed its legitimacy to its empirical success. Little in the way of theoretical justification was offered (Deardorff 1998). Trade theory was based on the H-O factors proportion theory. The H-O theory predicts that countries export products that use their abundant factors of production (capital, labor) most. Helpman and Krugman (1985) applied the notion that the volume of trade depended on the products of the trading countries output (GDP). Bergstrand (1985) derived a gravity equation from a general equilibrium model. Bergstrand (1989) extended his earlier work by incorporating factor endowment variables (H-O) and taste preferences (Linder)[22] into

the analysis. Deardorff (1998) showed that the gravity model could be derived from a 'frictionless' H-O model of homogeneous products and one of differentiated products. Deardorff concludes: " . . . it is not all that difficult to justify . . . simple forms of the gravity equation from standard trade theory" (1998).

3.3 The Variables

The dependent variable in the gravity model is the value of exports between country i and country j. In our model we will use exports from i to j measured in millions of US$. Figures are taken from the *Direction of Trade Statistics Yearbook (DOTSY)*, published by the International Monetary Fund (IMF). It is common to use gross aggregate trade, exports plus imports (Bergstrand 1985, 1989; Frankel 1997; Freund 1998; Freund and McLaren 1998; Frankel and Rose 2000; Rose 2000), or to separate trade volume into exports and imports and run separate regressions (Tinbergen 1962; Linnemann 1966).

Frankel (1997) considered it acceptable to use combined export and import volume for simplicity sake as well as to avoid getting into the realm of macroeconomics. Others are content to use only exports (Deardorff 1998; Frankel and Wei 1998). (Pöyhönen 1963) considered only export volume in one of the earliest uses of the gravity equation.

The explanatory variables, DIST, GNP, and POP are elements of the basic gravity model. DIST is usually measured along the great circle route between major cities, usually the capital, of country i and country j. Exceptions are sometimes made to use a more centrally located city or one that is considered to be more of a trade center, such as

Chicago rather than Washington, D.C. Some researchers add a remoteness measure

(Frankel and Wei 1998) that is the distance from a country's average trading partner. The

intuition is that the more remote a country is from the rest of the world the greater its

trade volume. We will be content to use only the direct bilateral distance. The distance

measure is expected to be negative. The further one is from their trading partner the

higher the transportation costs thus, the lower the trade volume.

GNP or GDP is the most common measure of size. GDP is used in the project

because of the availability of data and wishing to use the same data source (the IMF) for

consistency. There does not appear to be any preference in the literature for GNP versus

GDP. Frankel (1997) found little difference and used GNP due to the availability of data.

Linneman (1966) considered GDP more appropriate since exports could come from

either domestic or foreign owned producers. Bergstrand (1985, 1989, 1990) used GDP as

did Frankel and Rose (2000), Rose (2000), and Freund and Mclaren (1999).

POP is another measure of size and used either singularly or to determine GDP

per capita.[23] Our model uses population data from the IMF *International Financial*

Statistics to determine per capita GDP. The standard gravity model predicts that

countries with similar levels of per capita GDP will trade more than countries with

dissimilar output (Frankel 1997). GDP and GDP/POP estimates are expected to be

positive but less than one. Rich countries tend to trade more than poor ones. On the

other hand, smaller economies are more open to trade than larger ones, thus trade

increases less than proportional to its size (Frankel 1997).

In addition to the variables described above, dummy variables for common language (LANG) and for countries having a common border (ADJ) are often included. If country i and country j share a common language they are given a value of 1 and a 0 otherwise. Intuitively it is easier to do business with someone who shares your language. For countries sharing a common border, the same procedure applies. If country i and country j share a common border they are given a value of 1 and 0 otherwise. Again intuitively it is easier to trade with ones next door neighbor than someone three countries away. Common borders were determined using a CIA regional map available on the World Wide Web.

Any number of other variables can be added depending on what is being tested. In this case, we are interested in first whether or not membership in a PTA, specifically the EU, is a significant factor for its members and ultimately we test if having a common currency-the euro-is a significant determinate of trade flows. For membership in the EU, or for belonging to a common geographical region (CR), countries are given a 1, 0 otherwise. For being a member of the Euro-zone the same is true: 1 if a member, 0 otherwise. Other dummy variables such as colonial ties or for being landlocked are sometimes included. Historical ties such as those formed through colonial relationships can influence trade volume. Familiarity with trading partners and established production or transportation facilities are expedients to trade. Whether or not a country is landlocked or an island is often considered in trade flows. Landlocked countries, lacking access to port facilities, are thought to have higher transportation costs associated with trade

decreasing the volume of trade. Island nations are more likely to trade. Including too many variables uses up degrees of freedom.

The countries used are the set of 23 industrialized countries as categorized by the IMF. Data for Belgium and Luxembourg are combined. This gives us a data set of 462 points (22 x 21) for a given year. This includes all of the fifteen EU countries and accounts for 68% of world trade. Broader studies such as Frankel and Rose (2000) and Rose (2000) use all countries. We are interested only in what effects the introduction of the euro has had on trade between EU countries and other industrialized countries. We conduct the analysis for 1987, 1992, 1997, and 1999 the only year for which data for the euro is available.

Ordinary least-squares regression analysis will be used to estimate the effects the various explanatory variables have on the dependent variable, in this case the trade flow between country i and country j. Applied properly to an adequate data set, OLS gives a reliable estimate of the effect each variable has on the trade flow. OLS technique fits a line that minimizes the vertical sum of the squared deviations from the fitted line (Pindyck and Rubinfeld 1998). Formally OLS is: Minimize $\sum_{i=1}^{N} (Y_i - \acute{Y}_i)^2$ where $\acute{Y}_i = a + bX_i$ represents the equation for a straight line with intercept a and slope b. Y_i is the actual value of Y for observation i and corresponds to the value of X for that observation, while N is the number of observations. $\acute{Y}_i$, the fitted or predicted value of Y_i, is the value of Y on the straight line associated with observation X.

4.0 Empirical Results

4.1 OLS Estimations

Variations of equation (1) were estimated using ordinary least squares. First, the following basic gravity equation was estimated:

$$\log(X_{ij}) = a + \beta_1 \log(GDP_i\, GDP_j) + \beta_2 \log(GDP/pop_i\, GDP/pop_j) + \beta_3 \log(DIST_{ij}) + e_{ij} \qquad (2)$$

Equation (2) is expanded to include ADJ, LANG, EU, and CR dummy variables and then estimated. Finally the dummy variable EURO, indicating membership in the Euro-system, is added for 1999 to yield equation (2a):

$$\log(X_{ij}) = a + \beta_1 \log(GDP_i\, GDP_j) + \beta_2 \log(GDP/pop_i\, GDP/pop_j)$$
$$+ \beta_3 \log(DIST_{ij}) + \beta_4 (ADJ_{ij}) + \beta_5 (LANG_{ij})$$
$$+ \gamma_1 (EU_{ij}) + \gamma_2 (CR_{ij}) + \gamma_3 (EURO_{ij}) + e_{ij} \qquad (2a)$$

The regressions were tested for heteroscedasticity and serial correlation. Applying White's test, we reject the null hypothesis of homoscedasticity at the 5% percent level of significance for all models. The regressions were corrected for heteroscedasticity. Table 3 shows the coefficien estimates and the t-statistics corresponding to the heteroscedastic-consistent standard errors.

The Durbin-Watson (DW) test was used to check for serial correlation, the possibility that residuals are correlated with their own lagged values or in the case of cross section data the possibility of a missing variable. The DW test statistics for 1987, 1992, and 1997 fell in the indeterminate range. For 1999, however, the DW test statistic of 1.50 fell below the lower bounds ($d_l=1.57$).[24] This suggests the possibility that first order serial correlation is caused by a missing variable. Consequently, a dummy variable, CR, for belonging to a common geographical region (in this case, Europe, North

Table 3

	1987			1992		
LOGGDP	0.809954ᵃ (35.36520)	0.792602ᵃ (34.19536)	0.838882ᵃ (33.04293)	0.807395ᵃ (34.82657)	0.828705ᵃ (35.81152)	0.848198ᵃ (34.66810)
LOGGDP/POP	0.031463 (0.737807)	0.058609 (1.358415)	0.070504ᶜ (1.658026)	0.042478 (0.443967)	-0.058036 (-0.669460)	0.052450 (0.53451)
LOGDIS	-0.892712ᵃ (-25.70400)	-0.773443ᵃ (-15.33202)	-0.511795ᵃ (-7.676601)	-0.887817ᵃ (-28.25984)	-0.792116ᵃ (-14.92656)	-0.576848ᵃ (-7.574325)
ADJ		0.321317ᵃ (2.828562)	0.455862ᵃ (3.900488)		0.230882ᶜ (1.904460)	0.339954ᵃ (2.702247)
LAN		0.691030ᵃ (5.327634)	0.735485ᵃ (5.585116)		0.542278ᵃ (3.658181)	0.587139ᵃ (3.975662)
EU		0.352220ᵃ (3.700688)	0.198934ᵇ (1.985745)		0.275564ᵇ (2.508680)	0.120002 (1.089805)
EURO						0.711033ᵃ (3.827165)
CR			0.838316ᵃ (4.710613)			
ADJ R²	0.850750	0.863798	0.870147	0.867465	0.860546	0.871988
S.E.	0.812232	0.775917	0.757615	0.767267	0.787040	0.754061
D-W	1.722907	1.676617	1.717133	1.652862	1.633892	1.693544
OBS	461	461	461	458	458	458

OLS estimations. Intercept not displayed. DW: $d_l = 1.57$, $d_u = 1.78$

t-statistics in parenthesis. White heteroscedasticity-consistent standard errors and covariance.

a = significant at 99%. Critical t = 2.576
b = significant at 95%. Critical t = 1.960
c = significant at 90%. Critical t = 1.645

Table 3 (cont.)

	1997			1999			
LOGGDP	0.831191ᵃ (38.53558)	0.802989ᵃ (37.28358)	0.838496ᵃ (37.15107)	0.833201ᵃ (37.13801)	0.807244ᵃ (33.98962)	0.804993ᵃ (33.94936)	0.835210ᵃ (38.59105)
LOGGDP/POP	0.107739 (1.244019)	0.283691ᵃ (2.795152)	0.286175ᵃ (2.895005)	0.060693 (0.582113)	0.219149ᶜ (1.727711)	0.237549ᶜ (1.872240)	0.223735ᵇ (2.311511)
LOGDIS	-0.929435ᵃ (-28.2700)	-0.785707ᵃ (-15.19890)	-0.590742ᵃ (-9.045502)	-0.971074ᵃ (-27.89355)	-0.857149ᵃ (-15.48371)	-0.860833ᵃ (-15.65477)	-0.703608ᵃ (-9.865821)
ADJ		0.257650ᵇ (2.099618)	0.362409ᵃ (2.989423)		0.176533 (1.391400)	0.095397 (0.725513)	0.181096 (1.115073)
LAN		0.671070ᵃ (6.162096)	0.702738ᵃ (6.413536)		0.753119ᵃ (7.007605)	0.777135ᵃ (7.095142)	0.804015ᵃ (5.722767)
EU		0.485137ᵃ (4.420525)	0.355347ᵃ (3.101796)		0.416119ᵃ (3.420260)	0.246863ᵇ (1.929098)	0.131346 (1.009091)
EURO						0.365552ᵃ (3.652139)	0.362685ᵃ (3.636976)
CR			0.635026ᵃ (3.830805)				0.523075ᵃ (2.992948)
ADJ R²	0.860578	0.873473	0.876903	0.847465	0.859179	0.861700	0.863939
S.E.	0.798903	0.761063	0.750676	0.837822	0.802380	0.795166	0.788704
D-W	1.654080	1.657537	1.686960	1.473171	1.469675	1.507098	1.503342
OBS	462	462	462	461	461	461	461

OLS estimations. Intercept not displayed. DW: $d_1 = 1.57$, $d_u = 1.78$

t-statistics in parenthesis. White heteroscedasticity-consistent standard errors and covariance.

a = significant at 99%. Critical t = 2.576
b = significant at 95%. Critical t = 1.960
c = significant at 90%. Critical t = 1.645

America, or Asia/Pacific) was added. Only a small amount of improvement was made in the DW statistic for 1987, 1992, and 1997. The DW for 1999 fell slightly from 1.507 to 1.503. This suggests that the included regressor is not the missing variable we suspected.[25]

Estimates of the coefficients for size, GDP and per capita GDP (GDP/POP) give mixed results compared to the literature. The GDP coefficient estimates are consistent in magnitude and significant at the 1% level for all years. The values are comparable to other researchers' estimates of about 0.8 (Frankel 1997; Freund 1998; Rose 2000; Frankel and Rose 2000). Properly interpreted, the coefficients are a measure of short-term elasticity. A coefficient of 0.8 suggests that for each 1 % increase in GDP, trade volume will increase 0.8%. The GDP/POP coefficient estimates were significant only for 1997 at the 10% level and for 1999 at the 5% level. The coefficient estimates range from 0.07 in 1987 to 0.22 in 1997 for the expanded model. Rose (2000) and Frankel and Rose (2000) who did projects on the effects of currency unions on trade estimate values of about 0.66. Freund's (1998) estimates range from –0.48 to 0.22 and Frankel's (1997) estimates range from 0.087 to 0.425. One explanation for our lower values is that countries in the group of industrialized countries show relatively little variation in per capita income compared to the set of all countries.

Distance estimates are highly significant at the 1% level for all years and are negatively signed as predicted by the theory. Our estimates range from –0.51 in 1987 to –0.70 in 1999 for the expanded equation. The literature varies on the size of the distance estimates. Rose (2000) shows a range of –1.09 to –1.15 for the set of all countries.

Frankel (1997) and Frankel and Rose (2000) show similar ranges. Freund's (1998) results are in the range –0.78 to –0.37 for the set of EU-12 countries.[26]

For the dummy variables LANG and ADJ (common language and adjacency or sharing a common border, our results are closer to those of Freund (1998) who used a smaller set of countries than to Frankel (1997), Frankel and Rose (2000), and Rose (2000) who used the larger set of all countries. For all years, our coefficient estimates for LANG were significant at the 1% level. The positive sign indicates that countries with similar languages do trade more. The 1999 LANG coefficient estimate of 0.80 suggests that countries with the same language trade nearly two and a quarter times more than those with different languages ($e^{0.80} = 2.23$).

The ADJ dummy is significant at the 1% level in 1987, 1992, and 1997. The positive sign indicates a common border is an expedient to trade. It is not statistically significant in 1999. It is possible that by 1999, the benefits of membership in the EU and the introduction of the euro absorbed some of the adjacency effect. Again, our results are more similar to the results from the smaller sample of Freund (1998) than of the larger samples already cited.

The effects of membership in the EU significant at the 5% level for 1987, at the 1% level in 1997and is statistically insignificant in 1992 and 1999. Our estimates are 0.20 and 0.36 for 1987 and 1997 respectively. Estimates from Rose and Frankel and Rose show larger effects from membership in PTAs in general, ranging from 0.67 to 1.26. Frankel (1997) found when testing for membership in specific PTAs that for a member of the EC in 1990 trade increase by 43% ($e^{0.36} = 1.43$). The dummy CR is

significant for all years and ranges from 0.52 in 1999 to 0.84 in 1987. It would appear

that the effects of the common region variable are absorbed over time by membership in

the EU and the euro-zone effect.

For membership in the euro-zone our results show trade increases about 50%

($e^{0.36}$ = 1.43) and is significant at the 1% level. As an illustration of the effect

membership in the euro-zone could have, if the United Kingdom had been a member in

1999 a 43% increase in trade volume would have translated into an extra $155.5 billion.[27]

Rose (2000) found a coefficient of 1.2 in his larger study that included all countries and

all (17) currency unions for an effect of magnitude 3 ($e^{1.2}$ = 3.3). Frankel and Rose

(2000) found a similar size effect. It would be reasonable to assume that many of the

benefits of a currency union have already been absorbed by the EU-11, thus accounting

for our lower estimate.

A note of caution should be interjected at this point. This is a relatively small

data sample. The sample, members of the group of industrialized countries, is only about

10% of the population of all countries. The sub-set of countries in the Euro-zone, eleven,

is only half of the sample population with only one year's data for the euro. Larger data

samples yield more reliable results, so while our results can be shown to be statistically

significant, caution must be exercised in the conclusions reached. Further research in

subsequent years will either confirm or disprove the tendencies shown here.

5.0 Policy Implications and Conclusions

5.1 The Political Economy of Trade Policy

Using the gravity model of bilateral trade we have tested to see if membership in a currency union, specifically the Euro-zone, has an effect on the volume of trade. Given the limited data available, we cautiously conclude there is a positive effect. Our results show trade increases for members of the Euro-zone nearly one and a-half times over non-members. The coefficients for the other variables are consistent, in greater or lesser degrees, with other researchers.

Considering the 'second best' status of PTAs to multilateral free trade, what are the prospects of the continued formation of PTAs and eventually currency zones? Is the formation of PTAs building blocks or stumbling blocks? Bhagwati (1999) considers them stumbling blocks. Krugman (1991) considers them desirable up to a point. If blocs are made up of natural regional partners they are likely to be desirable. On the other hand if they are 'supernatural' in which transportation costs make them welfare reducing they are undesirable.

The move to form PTAs is as likely to be political as from the wish to apply sound economic principles. This is particularly evident in the EU and the adoption of the euro. Critics point to the loss of monetary and fiscal policy options to individual member countries in the face of economic shocks. Cynics point out that some countries lack the political will to undertake the structural adjustment necessary to stabilize their economies and make them competitive in the world economy. They would rather pass the buck to a

collective central bank. Others view the ECB as preferable to the German Bundesbank making economic policy for the rest of Europe.

Proponents point to gains to European commerce with the reduction in transaction costs realized with a common currency. The results of our study suggest trade has increased due to the euro. Increased trade is a catalyst to increased economic growth (Frankel and Rose 2000). Supporters of the Euro-zone envision an economic power to challenge the United States. Critics fear and supporters envision a United States of Europe.

Will other PTAs follow suit and adopt a single currency? While early evidence indicates some economic benefits to a single currency, the euro has yet to stand the test of time. How will the Euro-zone react to a major economic shock to one of its member? Will the benefits out weigh the costs? These are only some of the questions that will require further research.

From our tests of the data we can only conclude that the introduction has had a positive impact on trade for the members of the Euro-zone. Analysis of subsequent years' data will be needed to determine the magnitude of the effect. In the meantime, how well the euro is received by the citizens of EU will hinge primarily on how the politicians react to economic forces that are sure to challenge the Euro-system.

Appendix

Table 4

History of the European Community

1947	Truman Doctrine announced by US. Marshall Plan for the economic reconstruction of Europe. Establishment of GATT.
1948	"Benelux customs union between Belgium, the Netherlands, and Luxembourg. Congress of Europe meets in the Hague to discuss concept of a federal Europe."
1948	"Treaty of Brussels establishing the Western Union - Belgium, France, Netherlands, & the UK."
1949	Signing of the Washington Treaty founding NATO.
1951	"Treaty of Paris creates European Coal & Steal Community (ECSC) - Belgium, France, Germany, Italy, Netherlands, & Luxembourg (The Six)."
1954	Treaty of Brussels expands to include Germany & Italy. Becomes Western European Union (WEU).
1957	The Six' sign the Treaty of Rome establishing the European Economic Community (Common Market). EUROATOM Treaty establishes the European Atomic Energy Commission.
1962	Common Agricultural Policy (CAP) established.
1968	Customs duties for intra-community trade in manufactured goods abolished. Common external tariff established.
1973	"Denmark, Ireland and the UK join the EC."
1979	Greece joins EC. The European Monetary System (EMS) begins operation.
1986	Portugal & Spain join EC.
1989	Berlin wall comes down.

Table 4 (cont.)

1990	Establishment of European Bank of Reconstruction and Development (EBRD).
1992	Treaty on European Union (TEU-Maastracht Treaty) signed. Governing treaty of the European Union (EU).
1993	"Single Market of European Free Trade Association (EFTA) allows free movement of persons, goods, services and capital."
1995	"Austria, Finland, and Sweden join EU to bring membership to 15."
1997	Amsterdam Treaty signed. Member states agree to cooperate on economic policy to stimulate growth and create jobs.
1999	European Monetary Union (EMU) commences for all members except Greece & Sweden which did not meet criteria & Denmark and UK opted out. Leaves 11 countries to adopt the euro.
2001	Greece meets criteria and ascends to the Euro-system.

Source: Leonard (2000)

Table 5 (cont.)

June 1988	At European Council in Hanover Helmut Kohl accepts need for integration of monetary and economic policy: study of EMU commissioned from Jacques Delors.
July 1988	Liberalization of capital movements.
June 1989	European Council in Madrid accepts Delors report on EMU.
February 1992	"Treaty on European Union signed at Maastricht: three phase approach to EMU enshrined, involving tough convergence criteria".
September 1992	UK and Italy forced to withdraw from ERM.
August 1993	ERM band widened.
December 1993	"Commission White Paper on Growth, "Competitiveness and Employment".
January 1994	Stage two of EMU begins: establishment of European Monetary Institute(EMI).
December 1995	Madrid European Council decides on the name 'euro' and adopts changeover programme.
January 1997	"In the absence of a majority of member states meeting the convergence criteria, passage to Stage Three postponed".
May 1998	Brussels European Council decides that 11 member states should go forward to stage three.
July 1998	European Central Bank takes over from EMI.
January 1999	"Euro to be created. ESCB will take over responsibility for single monetary policy, foreign exchange operations and the Target payment system".
January 2002	Euro to appear in notes and coins.
July 2002	National currencies will cease to have legal tender.

"Source: Duff, 1998."

Table 6

GATT to WTO

1947	23 countries negotiate GATT
1948	GATT provisionally enters into effect. The ITO (Havana) charter is drafted.
1949	Eleven countries participate in the Annecy round of tariff negotiations.
1950	China withdraws from GATT. US fails to ratify ITO.
1951	Torquay round of tariff negotiations. West Germany accedes to GATT.
1955	GATT modifies numerous provisions. Japan accedes to GATT.
1956	Geneva round of trade negotiations.
1957	Creation of European Economic Community
1960	Council of Representatives takes over GATT housekeeping duties. The Dillon round of negotiations is started.
1962	The Long Term Arrangement on Cotton Textiles is negotiated.
1964	The Kennedy round of negotiations begins. Concludes in 1967.
1973	Tokyo round begins. Concludes in 1979.
1974	The Multifibre Arrangement enters into force.
1986	Uruguay round starts.
1990	Canada introduces proposal to establish a 'Multilateral Trade Organization'.
1990	GATT ministerial meeting fails to conclude Uruguay round.
1994	WTO is established.

Table 7 *Descriptive Statistics*

1987	*X*	*DIS*	*POPi*	*POPj*	*GDPi*	*GDPj*
Mean	2882.974	5450.956	34.68306	34.86766	590.9942	591.4277
Median	604.9000	2299.578	10.00000	10.24000	161.4409	172.4785
Max.	85017.00	19868.12	242.8400	242.8400	4752.500	4742.500
Min.	0.070000	174.0240	0.250000	0.250000	5.406676	5.406676
Std. Dev	7482.927	5865.427	54.06367	53.95515	1055.899	1053.779
Obs.	461	461	461	461	461	461

1992	*X*	*DIS*	*POPi*	*POPj*	*GDPi*	*GDPj*
Mean	4210.310	5407.845	37.02694	37.06066	885.0036	886.2152
Median	895.5000	2278.697	10.44000	10.44000	247.5600	247.5600
Max.	103860.0	19868.12	255.3700	255.3700	6318.900	6318.900
Min.	1.000000	174.0240	0.260000	0.260000	6.910000	6.910000
Std. Dev	10469.67	5829.409	56.96397	56.94734	1463.234	1462.737
Obs.	458	458	458	458	458	458

1997	*X*	*DIS*	*POPi*	*POPj*	*GDPi*	*GDPj*
Mean	5411.799	5475.457	37.82909	37.83182	1025.038	1025.036
Median	1205.000	2299.578	10.55500	10.55500	258.5350	258.5332
Max.	177317.0	19868.12	268.0100	268.0100	8300.800	8300.800
Min.	1.000000	174.0240	0.270000	0.270000	7.470000	7.474205
Std. Dev	14555.50	5882.682	59.16078	59.16485	1845.267	1845.268
Obs.	462	462	462	462	462	462

1999	*X*	*DIS*	*POPi*	*POPj*	*GDPi*	*GDPj*
Mean	6245.165	5449.861	38.24499	38.25265	1100.981	1101.100
Median	1204.000	2299.578	10.63000	10.63000	259.1500	259.1532
Max.	208013.0	19868.12	273.1300	273.1300	9256.100	9256.100
Min.	1.000000	174.0240	0.280000	0.280000	8.810000	8.814931
Std. Dev	18290.89	5863.262	60.12353	60.11890	2028.135	2028.072
Obs.	461	461	461	461	461	461

Table 8   **Confidence Intervals**

1987

Variable	Coefficient	SE	t_{crit}	Interval	Lower	Upper
gdp	0.792602	0.023179	1.96	0.045431	0.747171	0.838033
gdp/pop	0.058609	0.043145	1.96	0.084564	-0.025955	0.143173
dis	-0.773443	0.050446	1.96	0.098874	-0.872317	-0.674569
adj	0.321317	0.113597	1.96	0.222650	0.098667	0.543967
lan	0.691030	0.129707	1.96	0.254226	0.436804	0.945256
ec	0.352220	0.095177	1.96	0.186547	0.165673	0.538767

1992

Variable	Coefficient	SE	t_{crit}	Interval	Lower	Upper
gdp	0.807395	0.023183	1.96	0.045439	0.761956	0.852834
gdp/pop	0.052450	0.098193	1.96	0.192458	-0.140008	0.244908
dis	-0.792116	0.053068	1.96	0.104013	-0.896129	-0.688103
adj	0.230882	0.121232	1.96	0.237615	-0.006733	0.468497
lan	0.542278	0.148237	1.96	0.290545	0.251733	0.832823
ec	0.275564	0.109844	1.96	0.215294	0.060270	0.490858

1997

Variable	Coefficient	SE	t_{crit}	Interval	Lower	Upper
gdp	0.802989	0.021561	1.96	0.042260	0.760729	0.845249
gdp/pop	0.283691	0.021537	1.96	0.042213	0.241478	0.325904
dis	-0.785707	0.101494	1.96	0.198928	-0.984635	-0.586779
adj	0.257650	0.051695	1.96	0.101322	0.156328	0.358972
lan	0.671070	0.122713	1.96	0.240517	0.430553	0.911587
ec	0.485137	0.109747	1.96	0.215104	0.270033	0.700241

1999

Variable	Coefficient	SE	t_{crit}	Interval	Lower	Upper
gdp	0.804993	0.023712	1.96	0.046476	0.758517	0.851469
gdp/pop	0.237549	0.126880	1.96	0.248685	-0.011136	0.486234
dis	-0.860833	0.054989	1.96	0.107778	-0.968611	-0.753055
adj	0.095397	0.131489	1.96	0.257718	-0.162321	0.353115
lan	0.777135	0.109531	1.96	0.214681	0.562454	0.991816
ec	0.246863	0.127968	1.96	0.250817	-0.003954	0.497680
euro	0.365552	0.100093	1.96	0.196182	0.169370	0.561734

Table 9 **List of Countries**

United States
Canada
Australia
Japan
New Zealand
Austria[ab]
Belgium[ab]
Denmark[a]
Finland[ab]
France[ab]
Germany[ab]
Greece[ab]
Iceland
Ireland[ab]
Italy[ab]
Luxembourg[ab]
Netherlands[ab]
Norway
Portugal[ab]
Spain[ab]
Sweden[a]
Switzerland
United Kingdom[a]

a=member EU   b=member euro-zone

Table 10   **Data Appendix**

X_{ij} Exports from country i to country j in millions of $US. Source: IMF *Direction of Trade Statistics Yearbook* for the appropriate year. Belgium and Luxembourg are combined for all years. West Germany and East Germany are combined for 1987; 1992, 1997, and 1999 reflex post unification data.

GDP   Gross domestic product in millions of $US. Source: IMF *International Financial Statistics*. Figures are reported by the IMF in country currency units, which are converted to $US using average period market exchange rates. For EU-11, 1999 GDP is in euros. The appropriate euro/$ rate was applied for conversion. 1999 GDP figures for New Zealand, Ireland, and Portugal are from the *CIA Worldfact Book*. Available from World Wide Web: (http:/www.cia.gov) Belgium and Luxembourg are combined for all years. West Germany and East Germany are combined for 1987. 1992, 1997, and 1999 reflex post unification data.

POP   Population in millions, mid-year estimates. Source: IMF *International Financial Statistics*. 1999 population of Norway is from the *CIA Worldfact Book*. Available from World Wide Web: (http:/www.cia.gov) Belgium and Luxembourg are combined for all years. West Germany and East Germany are combined for 1987; 1992, 1997, and 1999 reflex post unification data.

DIS   The distance measure is the great circle distance between capital cities. Provide by Dr. Catherine Co, University of Nebraska at Omaha, Department of Economics from Jon Haveman. Available World Wide Web: (http://intrepid.mgmt.purdue.edu/Jon/Data/TradeData.html)

LANG   Language groups provided by Dr. Catherine Co, University of Nebraska at Omaha, Department of Economics from Jon Haveman. Available World Wide Web: (http://intrepid.mgmt.purdue.edu/Jon/Data/TradeData.html)

ADJ   Determination of common borders from *CIA Worldfact Book*. Available from World Wide Web: (http:/www.cia.gov)

EU   The 15 members of the EU are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

EURO   As of 1 January 2001 twelve of the EU-15 countries have meet the convergence criteria and are members of the Euro-system: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, and Spain.

Table 10 (cont.)

CR   Common region: United States and Canada; Australia, New Zealand, and
       Japan; Austria, Belgium, Denmark, Finland, France, Germany, Greece,
       Iceland, Ireland, Italy, Luxembourg, The Netherlands, Norway, Portugal,
       Spain, Sweden, and the United Kingdom.

Endnotes

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[1] The Euro-zone or EU-12 refers to the twelve members of the EU that have adopted the euro as their common currency. They include: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, and Spain.

[2] Quoted in Irwin (1996).

[3] Quotations from the *Wealth of Nations* are cited according to the conventions of giving book, chapter, and paragraph.

[4] See O'Brien (1975), for an overview of classical trade thought.

[5] The Corn Laws were British government policies designed to protect British agriculture from cheaper imports.

[6] The infant industry argument justifies the use of import tariffs to protect industries in developing countries until they are able to compete on the world market.

[7] Stagflation was a term coined in the 1970's to describe the simultaneous high inflation and economic stagnation of the period.

[8] In 1951, a permanent Council of Representatives replaced the inter-session committee that was responsible for day-to-day management.

[9] Agreements on services and intellectual property rights were included in the Uruguay round.

[10] Article XXIV allows PTA's so long as the arrangements do not exceed any restrictions already in place and steps are taken towards multilateral tariff reductions.

[11] Adapted from Krugman (1991). Krugman follows an analysis by Jacob Viner (1950).

[12] See Frankel (1997) for a review of relevant studies.

[13] Argentina, Brazil, Paraguay, and Uruguay formed the Mercado Común del Sur (Market of the South) in 1991. 19% of the 1994 foreign trade value of $131.0 billion was intrabloc (Frankel 1997).

[14] Formed in 1967, member nations include Brunei, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam. 22% of the $529.6 billion in foreign trade in 1994 was intrabloc (Frankel 1997).

[15] The terms EU (European Union) and EC (European Community) are often used interchangeably. Properly, the EC was the designation given to the combining in 1967 of the European Economic Community (EEC), the European Coal and Steel Community (ECSC), and the European Atomic Energy Community (Euratom). The EC formally became the European Union with the signing of the Maastricht Treaty in 1993.

[16] The current OECD membership includes 30 countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, The Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

[17] Netherlands, Belgium and Luxembourg formed the Benelux customs union in 1948.

[18] Italy, Belgium, The Netherlands, Luxembourg, France, and Germany.

[19] For a review of the Maastricht Treaty see Leonard (2000).

[20] See Hooper and Kohlhagen (1978) and Kenen and Rodrick (1986).

[21] The 'Protocols' as well as other documents relating to the ESCB and the ECB can be obtained from the World Wide Web @ http://www.ecb.int/ The site also contains statistics pertaining to the ESCB and the ECB as well as downloadable research papers and publications.

[22] The Linder (1961) hypothesis says that countries with similar levels of per capita income will have similar preferences and similar but differentiated products, and thus trade more with each other.

[23] Frankel (1997) shows that it is mathematically equivalent to use population singularly or to determine per capita GDP.

[24] For n=100+ and df=5+, d_u=1.57 and d_l=1.78.

[25] Since there are signs of correlation in the residuals, our results should be interpreted with caution.

[26] France, Germany, Italy, Belgium, Luxembourg, The Netherlands, Britain, Ireland, Denmark, Greece, Portugal, and Spain. Insufficient data was available for Austria, Finland, and Sweden who had only just acceded to the EU (Freund 1998).

[27] The total trade volume of the United Kingdom for 1999 was $361.6 billion. 1.43 x $361.6 billion = $517.1 billion for an increase of $155.5 billion.

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