

The US-EU Relationship: How European Integration Affects US Exports to the European Union

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Abstract

The past few decades in Europe have been characterized by the integration of European economies. These developments are likely to affect not only the European economy, but the economies of several other countries that have ties with Europe. As the European Union's largest trading partner, the United States should be aware of how the changes going on in Europe are likely to affect the US economy. The purpose of this paper is to determine the effect of the European integration on US exports to the EU. Data on the GDP of the EU-15 and the exchange rate of the euro and the dollar came from the International Financial Statistics Yearbook and data on the amount of US exports to the EU-15 came from the International Monetary Fund. 25 observations (1980-2004) were used in this study and a linear regression model was used to show the impact of European integration on US exports to the EU. The results show that although the years characterized by integration under the Single Europe Act and the Maastricht Treaty saw an increase in the amount of US exports to the EU (controlling for the exchange rate, EU GDP, and exports lagged one year), exports to the EU decreased in the years characterized by integration after the introduction of the euro.

Keywords: European Economic Community, European Integration, Mutual Recognition Agreement, the Single Europe Act, Maastricht Treaty, and the EURO

Introduction

In the aftermath of World War II, as European leaders noted the destruction, both in economic and human terms, they began looking at ways to keep peace between their nations in the future. Deciding that economic interdependence was key to keeping the peace, six nations joined together to create the European Economic Community. Due to the success of this organization, Europe's attempt to integrate their economies grew into what is now known as the European Union, and what started out as six nations trying to promote peace and economic stability has grown into an organization of 25 nations, the world's largest economy.

The European Union's roots began in 1950 with the integration of the steel and coal industries of six European nations: Belgium, Germany, Luxembourg, France, Italy, and the Netherlands. The European Coal and Steel Community was such a success that these nations decided to further integrate their economies by creating the European Economic Community. The goal of the EEC was to remove barriers to trade between member nations, creating a common market. In 1992, the Maastricht Treaty was signed, forming the European Union and paving the way for the euro.

Literature Review

The Marshall Plan

The United States and Europe have a long-standing economic and trade relationship. This relationship was particularly strengthened in the aftermath of World War II. With the European economies and infrastructures in disarray, the United States developed the Marshall Plan to aid Europe's recovery. The Marshall Plan gave monetary assistance to certain European countries, provided that they agree to a joint economic recovery program. Over a period of four years beginning in 1948, the US gave over \$12 billion in assistance to these European nations.

The Single Market

In 1986, the Single European Act (SEA) was signed, revising the Treaty of Rome to promote the further integration of European economies. The goal was to change the institutional procedures of the EEC to facilitate the removal of trade barriers. Prior to the SEA, new policies regarding integration required a unanimous vote in the European Council which meant that few provisions were ever passed. The SEA allowed decisions to be made based on qualified majority voting instead of unanimity, allowing the Single Market to be completed by December 31, 1992. From 1987 to 1992, over 300 policies aimed at removing non-tariff barriers to trade were implemented.

Many of the policies that came as a result of the SEA affect trade within Europe and trade between Europe and other nations, including the United States. Measures aimed at eliminating non-tariff barriers to trade and making European corporations more competitive would make it cheaper to import from other EU nations relative to non-members. This could cause European nations to substitute EU imports for American imports, decreasing the amount of American exports.

A study by Peter Egger and Michelle Pfaffermayr (2002) discusses the impact of integration on intra-EU trade. They created dummy variables for different phases of European

integration based on the deepening of integration and the enlargement of the EU. Their results showed that with increasing integration, intra-EU trade growth increased as well. However, they noted that each additional form of integration had a smaller effect than the previous one.

An earlier study by Norman Aitken (1973) looks at the effect of the creation of the EEC on European trade. He found that during the years prior to the creation of the EEC, there was not a significant relationship between the amount of exports of a country and whether it was a future member of the EEC. However, after the creation of the EEC, the coefficient of the dummy variable representing trade between members of the EEC began to grow sharply, reaching significance at the .10 level in 1960. It also initially had a negative impact on non-member trading partners.

Andre Sapir (1992) found similar results when examining the impact of regionalism on trade in 1992. He looked at the effects of different stages of integration on the share of intra-EC imports. As integration deepened, the share of exports coming from other EC members dramatically increased. The share of intra-EC exports increased from around 40% to 55% after the implementation of the Treaty of Rome. This share remained constant until the signing of the SEA in 1986 after which the share of intra-EC imports increased to 60% shortly before 1992. This suggests that European integration has a large impact on the composition of trade with Europe substituting European goods for outside goods.

The Euro

The introduction of the euro as the single currency for 12 of the 15 EU members also has profound economic implications for the United States. The euro was introduced on January 1, 1999 for accounting purposes and inter-bank transactions, and by January 1, 2002 the euro notes began circulating.

The creation of the single currency will significantly affect trade within Europe. A switch from the independent currencies of each member state to the single currency will decrease the costs for businesses, both in Europe and abroad. Formerly, a business that made transactions with several European countries would have to exchange currencies several times; the business would have to use a different currency for each country it dealt with and had to keep track of the twelve different exchange rates. The larger number of currencies meant that formerly there was greater instability in the exchange rate, and created a larger risk for holding these currencies. However, with the introduction of the euro, businesses must now only keep track of one exchange rate for the single currency area and are assured of a more stable currency. This significantly lowers transaction costs for companies that do a large amount of business in Europe, whether they are EU members or not. This will, however, benefit European countries more than others as those within the euro zone will have no exchange rate risk or transaction costs whatsoever while American companies must still exchange from the dollar to the euro. This will increase the competitiveness of euro area members relative to American companies.

Because of this theoretical increase in competitiveness, we would expect the adoption of the euro to increase intra-EU trade. A study by Pieter Crucq (2002) confirmed this hypothesis, estimating that the introduction of the single currency increased trade as a percentage of GDP between members by .47%. However, while these results confirm that integration improves intra-EU trade, they do not make any conclusions on the effect of US-EU trade.

A less direct effect that the euro can have on the U.S. economy is that a stable currency in Europe should lead to lower interest rates, job creation, more investment, and as a result, strong

economic growth in Europe. Economic growth in Europe will lead to an increase in demand for products, many of which could come from the United States. If the euro can effectively stimulate the economy of Europe, it can also have the impact of increasing the amount of U.S. exports to the European Union.

The exchange rate of the euro to the dollar can also have a more direct effect on the volume of exports that the United States sends to the European Union. According to Thomas Fischer (2000), "if the euro proves weak against the dollar, U.S. goods and services will become dearer in Europe (our largest market), cutting our export income" (p.123). On the other hand, if the euro is strong against the dollar, American goods and services will become relatively cheaper in Europe fueling demand for U.S. exports. Although the euro has grown in strength against the dollar, it is difficult to measure with precision the exact impact that the exchange rate of the euro has had on the volume of U.S. exports.

US-EU Cooperation

Because the policies that the European Union and the United States adopt can have an important impact on each other, they have been working closely with each other on key economic issues. The New Transatlantic Agenda was adopted by the two bodies at the EU-US Summit on December 3, 1995. In it, the two vow to "strengthen regulatory cooperation, in particular by encouraging regulatory agencies to give a high priority to cooperation with their respective transatlantic counterparts, so as to address technical and non-tariff barriers to trade." One of the non-tariff trade barriers is the certification process for U.S. goods. About one half of US exports to the European Union require EU certification. This results in the costly and unnecessary duplication of product testing. As Irish Prime Minister John Bruton has said, "If it's safe enough for the United States, it [should] be safe enough for Europe and vice versa."

As a result of the New Transatlantic Agenda, a "mutual recognition agreement" which covers telecommunications equipment, medical devices, recreational craft, pharmaceuticals, electric safety, and electromagnetic compatibility has been enacted. Due to this agreement, agencies of the EU can assess how products meet US requirements, and vice versa. So in the same way that the unification of product standards within the EU reduces transaction costs for companies trading within the EU, the mutual recognition agreement between the EU and the United States significantly reduces the costs of exporters in both areas. Also, since American companies will be able to get their products EU certified in the United States, they will save thousands of dollars and will no longer have to perform duplicated testing. The same is true for EU companies wishing to export to the United States. It is estimated that \$40 billion of trade between the United States and the European Union will be expedited by eliminating these duplication costs.

The US and EU have also been cooperating on merger policies. On October 30, 2002, the European Union Competition Commissioner and the United States Department of Justice Antitrust Division released a set of guidelines to help the two coordinate merger reviews. According to the Federal Trade Commission, "the objectives of the best practices are to enhance cooperation between the U.S. antitrust agencies and the European Commission in merger review, minimize the risk of divergent outcomes, and reduce burdens on parties participating in merger investigations"(p.1). The practices that this agreement set up encourage the investigative staffs of the United States and the European Union to discuss the merger and its outcomes with each other at key points during the investigation process.

Although trade and cooperation between the United States and the European Union has grown significantly over recent years, neither has forgotten that they are still competitors. As a result, many high profile conflicts including WTO suits over agricultural subsidies and Boeing/Airbus subsidies have arisen between the two recently. In a few cases, the EU has banned certain American products such as hormone-fed beef.

Model and Hypotheses

The purpose of this research is to determine the effect of European integration on the amount of exports to the European Union. Three different models will be estimated and compared to see which has the most explanatory power.

Model 1:

$$\ln(\hat{y}) = \beta_0 + \beta_1 \ln(\text{ylag}) + \beta_2 \text{ex} + \beta_3 \ln(\text{GDPEU}) + \beta_4 \text{D1} + \beta_5 \text{D2} + \beta_6 \text{D3} + \beta_7 \text{D1} \ln(\text{ylag}) + \beta_8 \text{D2} \ln(\text{ylag}) + \beta_9 \text{D3} \ln(\text{ylag}) + E_{1i}$$

Model 2:

$$\ln(\hat{y}) = \beta_0 + \beta_1 \ln(\text{ylag}) + \beta_2 \text{ex} + \beta_3 \ln(\text{GDPEU}) + \beta_4 \text{D1} + \beta_5 \text{D2} + \beta_6 \text{D3} + E_{2i}$$

Model 3:

$$\ln(\hat{y}) = \beta_0 + \beta_1 \ln(\text{ylag}) + \beta_2 \text{ex} + \beta_3 \ln(\text{GDPEU}) + E_{3i}$$

where:

\hat{y} = exports from the US to the EU15

ylag = exports lagged one year

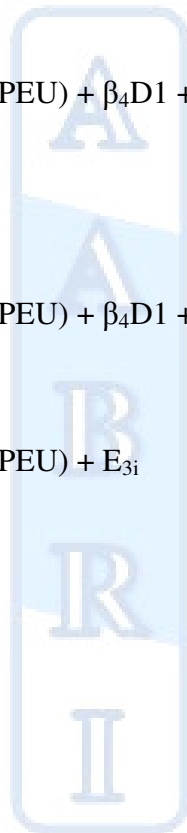
ex = exchange rate in dollars/euro

GDPEU = GDP of EU15

D1 = dummy variable taking the value of one since the implementation of the SEA(1987)

D2 = dummy variable taking the value of one since the implementation of the Maastricht Treaty (1992)

D3 = dummy variable taking the value of one since the introduction of the euro (2002)



Hypotheses:

Over the recent decades the world has trended toward globalization. In most major economies, exports as a percentage of GDP have been increasing steadily. Since, other things being equal, exports have been rising; we expect β_1 to be positive. This would mean that all other things equal, the amount of exports in one year would be larger than the amount of exports in the previous year.

The exchange rate in $\$/\epsilon$ acts as the price of euros, so the inverse of the exchange rate would be the euro price of a dollar. If the $(\$/\epsilon)$ exchange rate increases, the price of euros increases, and the price of the dollar decreases, making American goods relatively cheaper than European goods as Europeans can now buy more goods for the same price in euros. Thus, we expect β_2 to be positive since the devaluation of the dollar to the euro will make US goods relatively more inexpensive compared to European goods.

The GDP can be seen as a measure of wealth of a country. A higher GDP is associated with a higher national income. Thus, a country with a higher GDP should be able to afford more imports than a country with a lower GDP. For this reason, we expect β_3 to be positive since GDP is a measure of national wealth and the higher the GDP, the more exports the EU will be able to afford.

Since other empirical studies have shown that integration has increased the amount of intra-EU trade, it seems as though Europeans are substituting European imports for US imports. As barriers to trade are removed, it becomes relative cheaper to buy goods from within the union. Thus, as the level of integration increases within the EU we should expect a higher amount of trade occurring within the EU and a lower level of imports coming from the US. Thus, we would expect $\beta_4, \beta_5, \beta_6$ to be negative since a single currency will decrease transactions costs within the EU causing European goods to be relatively cheaper than US goods in Europe. Also, as the level of integration increases, we would expect the growth of US exports to the EU to be negative, all other things equal. This would make $\beta_7, \beta_8, \beta_9$ negative also.

Data

The regression model will be tested using annual data from 1980 to 2004 for a total of 25 observations. The annual average exchange rate of the dollar to the euro was obtained from the International Financial Statistics Yearbook. GDP data for the EU-15 was obtained for each individual country in 1995 billions of euros from the International Financial Statistics Yearbook and was summed for the EU-15 total. Data on the dollar amount of US exports to each individual country was obtained from the International Monetary Fund and summed for the EU-15 total. D1 takes the value of 1 from 1987 onward, D2 takes the value of 1 from 1994 onward, and D3 takes the value of 1 from 2002 onward.

Results

Goodness of Fit

To determine the best model, we will use the partial F-test. The ANOVA tables for the three models are as follows:

Model 1:

ANALYSIS OF VARIANCE - FROM MEAN				
	SS	DF	MS	F
REGRESSION	4.6870	9.	0.52077	263.820
ERROR	0.29610E-01	15.	0.19740E-02	P-VALUE
TOTAL	4.7166	24.	0.19652	0.000

Model 2:

ANALYSIS OF VARIANCE - FROM MEAN				
	SS	DF	MS	F
REGRESSION	4.6838	6.	0.78063	428.624
ERROR	0.32783E-01	18.	0.18213E-02	P-VALUE
TOTAL	4.7166	24.	0.19652	0.000

Model 3:

ANALYSIS OF VARIANCE - FROM MEAN				
	SS	DF	MS	F
REGRESSION	4.6153	3.	1.5384	318.885
ERROR	0.10131	21.	0.48244E-02	P-VALUE
TOTAL	4.7166	24.	0.19652	0.000

First we will use a partial F-test to determine if D1, D2, and D3 are significant by comparing Model 2 to Model 3, the most basic model. D1, D2, and D3 are significant at the 1% level if $F^* > 5.09$. The F-statistic is $F^* = 12.5419$ which is greater than 5.09 so D1, D2, and D3 are significant. Next we will use a partial F-test to determine if $D1\ln(\text{ylag})$, $D2\ln(\text{ylag})$, and $D3\ln(\text{ylag})$ are significant by comparing Model 1 to Model 2. $D1\ln(\text{ylag})$, $D2\ln(\text{ylag})$, and $D3\ln(\text{ylag})$ are significant at the 10% level if $F^* > 2.52$. The F-statistic is $F^* = .5001$ which is not greater than 2.52 so $D1\ln(\text{ylag})$, $D2\ln(\text{ylag})$, and $D3\ln(\text{ylag})$ are insignificant at all reasonable α -levels. Thus, the best model is Model 2. This is also confirmed by comparing the adjusted R^2 for each of the models. The adjusted R^2 for Model 1, Model 2, and Model 3 are .990, .9907, and .9755 respectively. Thus, adjusting for the degrees of freedom, Model 1 explains 99% of the variation in the amount of US exports to the EU, Model 2 explains 99.07%, and Model 3 explains 97.55%.

Thus, the best model to use is:

$$\ln(\hat{y}) = \beta_0 + \beta_1\ln(\text{ylag}) + \beta_2\text{ex} + \beta_3\ln(\text{GDPEU}) + \beta_4D1 + \beta_5D2 + \beta_6D3$$

To determine the goodness of fit for Model 2, we can use the F-test. With an F-statistic of 428.624, the p-value is .000 so the model is accepted at all levels of significance.

Multicollinearity

To determine if multicollinearity exists, we can examine the correlation coefficient of every pair of independent variables. The sample correlation coefficients for each pair of variables are given in the following table.

Independent Variables	Sample Correlation Coefficient
ex, log(ylag)	.18326
ex, log(gdp)	.093343
ex, D1	.43704
ex, D2	.048307
ex, D3	.0082711
ln(gdp), ln(ylag)	.95089
ln(gdp), D1	.70267
ln(gdp), D2	.84111
ln(gdp), D3	.59833
D1, ln(ylag)	.77469
D1, D2	.55277
D1, D3	.23028
D2, ln(ylag)	.82596
D2, D3	.41660
D3, ln(ylag)	.42826

In general, a pair of independent variables having a correlation coefficient greater than 80% suggests that there may be problems with multicollinearity. In this case, only three pairs of variables, ln(gdp) and ln(ylag), ln(ylag) and D2, and ln(gdp) and D2, have a correlation coefficient greater than 80%.

Heteroskedasticity

Based on the output for the regression of Model 2, heteroskedasticity is not a problem. The p-value for heteroskedasticity is .93354. Thus, we can conclude that the variance of the error term is not a linear function of the predicted value of the dependent variable.

Autocorrelation

Since there is a lagged variable in the model, the Durbin h-statistic must be used in place of the Durbin Watson test for autocorrelation. For this model, $h = .55563$. At $\alpha = .10$, we would reject the hypothesis of no autocorrelation if $h > .125$. Since h is greater than $.125$, we can conclude that there is positive first-order autocorrelation. We can correct for autocorrelation using the Cochrane-Orcutt method. The new estimated model has an R^2 value of $.9916$ and an adjusted R^2 of $.9888$. This means that adjusting for the degrees of freedom; the model explains 98.88% of the variance in $\ln(y)$.

Analysis of the Coefficients

The estimated coefficients along with the corresponding one-tailed p-values for each of the independent variables in the model adjusted for autocorrelation are listed in the following table.

Variable	Coefficient	P-value
$\ln(y_{lag})$	0.39041	.001
ex	0.33223	.000
$\ln(gdp)$	1.8755	.000
D1	.078314	.975
D2	0.086699	.962
D3	-0.10649	.057

Exports lagged

The expected sign of the coefficient for $\ln(y_{lag})$ was positive and the estimated coefficient was $.39041$. The one-tailed p-value for $\ln(y_{lag})$ was $.001$ meaning $\ln(y_{lag})$ is significant for any $\alpha > .1\%$. The coefficient suggests that a 1% increase in the amount of exports

from the US to the EU in one year will lead to a .39041% increase in the amount of exports from the US to the EU in the subsequent year, *ceteris paribus*.

Exchange Rate

The expected sign of the coefficient for *ex* was positive and the estimated coefficient was 0.33223. The one-tailed *p*-value for *ex* was .000 meaning that *ex* is significant at any reasonable α -level. The estimated coefficient suggests that a one unit increase in the exchange rate will lead to a 33.223% increase in the amount of exports from the US to the EU, *ceteris paribus*.

GDP

The expected sign of the coefficient for $\ln(\text{gdp})$ was positive and the estimated coefficient was 1.8755. The one-tailed *p*-value for $\ln(\text{gdp})$ was .000 meaning that $\ln(\text{gdp})$ is significant at any reasonable α -level. The estimated coefficient suggests that a 1% increase in the GDP of the European Union will lead to a 1.8755% increase in the amount of exports from the US to the EU, *ceteris paribus*.

The Single Europe Act

The expected sign of the coefficient for *D1* was negative and the estimated coefficient was .078314. The one-tailed *p*-value for *D1* was .975 which means that the coefficient is not significant and negative for any reasonable α -level. This suggests that the coefficient for *D1* is actually positive and significant for any $\alpha > 2.5\%$. The estimated coefficient suggests that the amount of exports from the US to the EU is 7.834% higher for years affected by the Single Europe Act than for years not affected by the act, *ceteris paribus*. The fact that the coefficient was positive rather than negative suggests that the positive effects resulting from a greater level of cooperation between the US and EU outweighed the negative effects resulting from the elimination of non-tariff barriers to trade within Europe.

The Maastricht Treaty

The expected sign of the coefficient for *D2* was negative and the estimated coefficient was .086699. The one-tailed *p*-value for *D2* was .962 meaning that the coefficient is not significant and negative at any reasonable α -level. This suggests that the coefficient for *D2* is actually positive and significant for any $\alpha > 3.8\%$. The estimated coefficient suggests that the amount of exports from the US to the EU is 8.6699% higher in years affected by the Maastricht Treaty than for years not affected by the act, *ceteris paribus*. The fact that the coefficient was positive rather than negative again suggests that the positive effects resulting from a greater level of cooperation between the US and EU outweighed the negative effects resulting from the elimination of non-tariff barriers to trade within Europe.

The Single Currency

The expected sign of the coefficient for *D3* was negative and the estimated coefficient was -0.10649. The one-tailed *p*-value for *D3* was .057 meaning that the coefficient for *D3* is

significant for any $\alpha > 5.7\%$. The estimated coefficient suggests that the amount of exports from the US to the EU is 10.649% lower in years affected by the move to the single currency than for years not affected by the single currency, *ceteris paribus*. This suggests that contrary to the SEA and the Maastricht Treaty, US-EU cooperation during this period did not have a larger impact on US exports than European integration.

The Interaction Variables

Based on the partial F-tests mentioned earlier, we can conclude that the interaction between $D1\ln(y_{lag})$, $D2\ln(y_{lag})$, and $D3\ln(y_{lag})$ are insignificant when the other variables are already present in the model.

Future Research

The dynamic nature of European integration gives several opportunities for future research into the area. Rather than looking at how integration has affected the amount of US exports to Europe, one could look at how integration has affected the ratio of US imports to total imports in European countries. Also, as more data is available in future years, this model could be re-estimated; the fact that only data is only available for three years with the single currency could mean that the results are not completely accurate. As more data is collected, a more accurate model could be estimated. Furthermore as Europe continues its integration, not only in the economic sphere, but in the political sphere, more research could be conducted to see if political integration significantly affects US exports to Europe. Another area of future research could focus primarily on agricultural trade between the United States and the European Union. This relationship is likely to be affected by integration since several of the new members of the European Union have mainly agricultural economies. The United States and the European Union have also had disagreements over agricultural issues such as trade, hormone-fed beef, and genetically modified agricultural products.

Conclusion

The past few decades in Europe have been characterized by rapid change and the integration of several economies. As the European Union's largest trading partner, the US will also be affected by the changes occurring in Europe. This paper has used ordinary least square regression to determine the exact effect of integration on US exports to Europe. We expected integration to have a negative effect on the amount of US exports to the EU since European countries may be substituting EU imports for US imports. However, this hypothesis was invalid. While the earlier stages of European integration had a positive effect on US exports to Europe, the most recent stage (the introduction of the euro) had a negative effect on US exports to Europe. Although integration did have an effect on the amount of US exports, it did not affect the rate of growth of US exports to the EU.

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