Estimating the trade effects from Finland's membership in the Euro: What are the lessons for Sweden?

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Abstract

The European Monetary Union was formed over a decade ago with a mission to create a single market with a single currency for the European Union members. Today only 19 out of the European Union members have adopted the official common currency, the Euro. The purpose for this thesis is to asses how the Euro has effected Finland's exports during the time period 1995-2014. This has been estimated through a gravity model including a Euro dummy variable. The Euro is found to be effecting Finland's exports negatively indicating that the lesson for Sweden is to remain outside of the Eurozone.

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Abbreviations

ECB	European Central Bank
EEC	European Economic Community
ECU	European Currency Union
EMS	The European Monetary System
EMU	European Monetary Union
ERM	European Exchange Rate Mechanism
EU	European Union
EU-28	The 28 EU member states in 2016
GDP	Gross Domestic Product
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
POP	Population

1 Introduction

A nation's flag, national anthem, and language is just like a currency, a symbol of statehood. So why abandon this to join a currency union? One possible reason could be that the country aims to increase its international trade.

The Euro is the official currency of the European Monetary Union (EMU). A monetary union is when nations join together to form a trading block. They agree to trade freely between themselves and adopt common external barriers against non-member nations. Within the currency union they allow free movement of labour and capital, but also adopt the same currency, the same central bank, and the same monetary policy. The Euro is a currency union implemented by 19 out of the European Union's 28 member states and will be referred to as the Eurozone throughout this paper. Today 337.5 million people use the Euro[1]. There are several advantages to a currency union. However, there are also disadvantage aspects which argue against the union and the abandonment of a country's national currency.

This paper will investigate how Finland's exports have been effected by the Euro. Finland was chosen to study because it has a similar industry structure to Sweden. I wanted to study a country that had the Euro as its currency to be able to predict what the Euros effect would have on Sweden's trade. Joining the currency union is an ongoing political issue in Sweden and therefore a current topic to study. The Euro was originally introduced as an electronic currency on January 1, 1999 and was implemented into banknotes and coins on January 1, 2002. Finland adopted the Euro as it was introduced while Sweden chose to stay on the side-lines[2] . In 2003 Sweden had a national referendum where the Swedish citizens said no to adopting the Euro. Today we have witnessed the countries go through two turbulent decades. The early 1990s recession rebounded with rapidly growing gross domestic products (GDP) and booming export industries for both Finland and Sweden. In contrast, the 2008

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[1] The European Commission's official website.

[2] The Swedish government conducted a report in 1996 (SOU 1996:158) stating that Sweden for the time being would keep the Swedish krona.

financial crisis hit Finland harder while Sweden managed to gain back its level of competitiveness. Did Sweden and Finland rebound from the 2008 financial crisis differently because of Finland's Euro membership? This initiated the idea of the thesis, how has the Euro effected Finland's trade flows looking specifically at the export sector and what are the lessons for Sweden.

The Gravity Model[3] is used to estimate if the Euro significantly effects Finland's exports. The model is a well established tool for studying bilateral trade. The main variable of interest is the Euro dummy variable but other variables that effect trade are also studied such as GDP, population, distance and preferential trade agreement. This study shows that the Euro effects Finland's exports negatively which is not what was predicted as previous research[4] give reason to believe that a currency union should increase trade.

The paper is structured in the following manner: first a brief background introducing the reader to the EMU accompanied by a theoretical section about trade. Then follows chapters three to six covering previous research, empirical strategy, empirical results and finally the summary and conclusion.

2 The European Monetary Union

This chapter informs the reader about the EMU and how it affects trade. A brief description about the currency union is followed by how it was formed. The chapter is concluded by discussing the pros and cons of the EMU.

2.1 Monetary Union

A monetary union replaces the individual national currencies creating a single common currency. The monetary policy to run the single currency is shifted from the national banks to a common central bank. Consequently, the exchange rate costs

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[3] The Gravity model is a tool used to study bilateral trade. It can be traced back to Newton's law of gravity. Which states that the gravitational force between two objects depend on two things, the mass of the object and the inverse of the distance between them (Shepherd 2013 p. 9).

[4] The previous research will be presented in chapter 3.

are eliminated when trading with a single currency (Feldstein, 1997). The formation of currency unions can be traced back in history to the 19th century but the most diverse union was formed in 1999, the European Monetary Union (EMU). It included, at the time, the most diverse set of countries with many different cultures and languages. The idea for the union emerged as a response to World War ll and the yearning for peace between countries. The Euro is the official currency of the EMU and the price stability and purchasing power is regulated by the European Central Bank (ECB) (EU,2015).

2.1.1 History of the Eurozone

The European Union was formed as a consequence of the World War II. The path to the Eurozone can be explained through four phases.

Table 1. Timeline of the EMU

Year	Happening
1950	European Coal and Steel Community is formed
1957	Phase 1, European Economic Community is formed
1970	Phase 2, The Werner Report
1979	Phase 3, The European Monetary System (EMS) was introduced
1991	Phase 4, new Treaty of the European Union is signed at Maastricht in 1991
1998	European Central Bank (ECB) enters into force.
1999	The Euro is introduced as non-physical money (electronically, as in checks and mortgage loans) and implemented by 11 countries.
2001	Greece joins the EMU
2002	The Euro banknotes and coins are introduced as the European Union single currency.
2007	Slovenia joins the EMU
2008	Cyprus and Malta join the EMU
2009	Slovakia joins the EMU
2011	Estonia joins the EMU
2014	Latvia joins the EMU
2015	Lithuania joins the EMU

Phase 1

In 1950 the European Coal and Steel Community is formed which is the start of uniting the countries politically and economically with the aim to secure peace (EU, 2015). The founding countries were Belgium, France, Germany, Italy, Luxembourg and the Netherlands. In 1957 the Treaty of Rome is signed creating a common market known as the European Economic Community (EEC) and welcome three new members to the community in 1973; Denmark, Ireland and the United Kingdom. These European leaders set up a plan on how to achieve the EMU by 1980, the so called Werner Report (EU, 2015).

Phase 2

The countries started preparing for the creation of the EMU and a single currency by restricting currency fluctuations. However, the Werner Report was unsuccessful as instability in international markets made restricting currency fluctuations impossible. Due to the combination of an ongoing oil crisis the plans for EMU were postponed until 1979 when the European Monetary System (EMS) was introduced (EU, 2015).

Phase 3

The EMS aim was to minimize volatility of the member state's exchange rates. It created, by a weighted average of the EMS countries currency, a reference exchange rate known as the European Currency Unit (ECU). The exchange rate had room for some adjustment, it allowed the member countries' currency a variation of ±2.25 %. The EMS was very successful and an essential step towards the formation towards a monetary and economic union. Thus another report was conducted on how to achieve the union, *the Delors Report*[5] (EU, 2015).

Phase 4

The "Delors Report" was accepted by the European leaders and put into motion. The new Treaty of the European Union was signed at Maastricht in 1991. When the treaty was signed convergence criteria was agreed upon in order to qualify for the single

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[5] The report was named after the European Commission President, Jacques Delors. The report defined the monetary unions objectives (EC, 2015).

currency the Euro (Baldwin and Wyplosz, p. 436, 2012).

- Price stability, inflation rate cannot be higher than 1.5 percentage points than the three best performing member countries
- Government deficit may not be higher than 3% of the country's GDP
- Government debt may not be higher than 60% of the country's GDP
- Interest rate no higher than 2 percentage points higher than the three best performing member in price stability.
- Participation in ERM[6] II for minimum of 2 years

The preparation for the Euro took a decade. In 1998 the monetary policy was passed over to the European Central Bank (ECB). On January 1, 1999 the Euro came into operation in a non-physical form alongside with the national currencies. The non-physical currency was added by 11 member states as they met the convergence criteria (Austria, Finland, Ireland, Italy, Belgium, Spain, France, Germany, Luxembourg, the Netherlands and Portugal). In 2002 the Euro became the official currency of the European union as it was implemented as banknotes and coins. Participation in the ERM II means to peg the countries national currency to the Euro. Sweden has chosen not to do this and therefore do not fulfil the requirements for membership. On the contrary to Denmark and the United Kingdom who have clauses in the treaty emancipating them from the Euro, Sweden is required to join once all the convergence criteria are fulfilled. Finland joined the EMU in 1995. Lithuania is the latest country to join (January 1, 2015) becoming to the 19th EU-member out of the 28 EU countries (EU, 2015).

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[6] ERM stands for European Exchange Rate Mechanism and it is one of the convergence criteria to join the EMU. Participation in the ERM II means to peg the countries national currency to the Euro for 2 years.

2.2 Pros and cons of the EMU

2.2.1 Pros

Being part of a trading block as large as the EMU brings many benefits to trading internationally. The Euro has a non-fluctuating exchange rate which gives it a stable purchasing power. A stable purchasing power enhances trade as it brings business confidence for investing. When business confidence improves you can expect greater investments due to planning for the future becoming easier. If a business is dependent on importing certain raw materials for production based purposes, they can predict what the price is going to be knowing that the currency is not going to fluctuate excessively. International trade is made easier if nations can trust that its currency can holds its value, international and foreign direct investments will increase as a result. This simplifies investment decisions for foreign investments as it is unlikely that the Euro is going to be over or undervalued, less speculation enhances trade (Flam and Nordström, 2006). Trade agreements become more time efficient as the discussion to which currency to use are removed (when trading with Euro-members). Prices within the Eurozone are also easier to compare for businesses and consumers as they are now in the same currency. Consequently, this leads to more competition, which is positive as it boosts producers to develop their products (Baldwin and Wyplosz, 2012). The reduction of costs that come from currency conversions is a major advantage. Consumers benefit as they are going to have more money in their pockets to buy Euro goods and services for, likewise the producers. If businesses trade within the Eurozone they avoid the cost of currency conversion which lowers the overall cost, which in return allows investments to increase and businesses to expand.

2.2.2 Cons

The main reasons why countries do no want to be part of EMU is due to the loss of autonomy of monetary policy, in exchange for one governing central bank in the union. This can be a disadvantage if the country has a different set of economic circumstances than the other nations in the trading block. There is no guarantee that the central monetary policy set is going to be suitable for individual nation (Baldwin

and Wyplosz, 2012). The country also looses the control over the money supply. Countries can no longer alter their exchange rate to boost trade performance. A country with an independent currency can artificially depreciate the nation's currency to make exporting goods cheaper, if in need of export based growth. Being part of the EMU this is no longer an option. A country cannot rely on a fall in the value of the Euro because it is outside the individual nation's control.

The transition from changing a country's currency is very expensive. Adopting the Euro has high physical costs of printing new banknotes and coins, getting the currency in circulation, taking away all the old banknotes and coins from the economy, as well as re-printing, for example, all menus and pricelists in an entire country (Baldwin and Wyplosz, 2012). It is an expensive process which also introduces the nation to a new risk. The EMU is a monetary union without a fiscal union. Not having a fiscal union sets the monetary union at risk as it has to rely on the member states to run fiscal policies that benefit the union. Greece, Portugal, Italy, Spain and Ireland are member nations that had to take strict austerity measures because of a reckless fiscal policy, overspending and inefficient tax collection. Austerity measures are enforced to avoid the threat of a country having to leave the Eurozone due to bankruptcy which could possibly cause a run on the currency. When this has occurred it acts as a major burden on the other nations within the Eurozone. It becomes a massive debt problem and as a result, the economically stable nations in the union have to bail out these countries and suffer the costs of it. A lack of a fiscal union could therefore lead to a destabilization of the entire trading block which would affect the Euro's purchasing power negatively and consequently decrease trade (BBC, 2015).

3 Previous Research

Since the Euro was introduced research on how the currency union affects trade has been a popular subject. Empirical studies show that there is a positive connection between trade and a currency union (Glick and Rose, 2016, Rose, 2000, Flam and Nordström, 2006). Presented below are the strategies and results the authors used and found.

Glick and Rose (2016) discuss the effect of currency unions on trade, which is a further study of their paper Glick and Rose (2002). In this study they have chosen to use a variety of models and panel data to analyse more than 200 countries between 1948 and 2013. Both papers use the gravity model to study bilateral trade however in 2002's publication Glick and Rose find that "a pair of countries which joined/left a currency union experiences a near-doubling/halving of bilateral trade". In contrast to their 2016 publication where they conclude that it is not possible to estimate the effect of a currency union on trade as a result of inconsistent results when the data was run through their econometric analysis.

Rose (2000) investigates the effects of exchange rate volatility, as well as a common currency has effect on how much countries trade with each other. This is conducted through a gravity model analysing the bilateral trade between 186 countries from 1970 to 1990. There is a positive connection between common currency and international trade and a minor negative relationship between exchange rate volatility and trade. Leading to the conclusion that countries that share the same currency trade as much as three times more as they would with different currencies.

Flam and Nordström (2006) study the Euro's effects on trade during the period 1995 to 2005. At the time there were 13 members of the European Union and 20 member of the Organization for Economic Co-operation and Development (OECD). They use these countries as their sample. Likewise, a gravity model is used in this paper. Their equation included variables for export to, with and from the Eurozone. Flam and Nordström state the interesting conclusion that not only did export within the Eurozone increase but so did export to Eurozone.

In summary, the research studied agrees that a common currency increases trade. However, the most previous paper, Glick and Rose (2016), state that it is hard to find sufficient evidence to this statement in contrast to the other papers that are published in the previous decade. Nonetheless they still provide empirical results, although inconsistent, that support this theory. This creates in an interesting platform for this paper as we cannot assume that a common currency will affect Finland's exports positively. Another thought-provoking point is made by Flam and Nordström (2006) stating that export to the Eurozone has increased, due to companies relocating their factories to inside the Eurozone allowing them to take part of the advantages. This becomes interesting as Finland is surrounded by countries that do not use the Euro today (with exception to Estonia).

4 Empirical Strategy

This chapter aims to describe the origin of the model used to estimate the Euro's effect on Finland's trade. The model is presented and the variables explained. The chapter is concluded by specifying the selection of data.

4.1 The Gravity Model

The Gravity model can be traced back to Newton's law of gravity. Which states that the gravitational force between two objects depend on two things, the mass of the object and the inverse of the distance between them (Shepherd 2013 p. 9). The Law was applied to bilateral trade when the economist Jan Tinbergen (1962) stated that the amount we trade is affected by the size of the country and the costs of trade. The size of a country affects the demand and supply. It can be measured through the GDP as larger countries tend to trade more due to the fact that they offer a greater variety of products, which affects trade positively (Krugman and Obstfeld, 2009, p. 15). The costs of trade can be measured through the distance; the further apart countries are the more expensive transport costs become. This variable is therefore assumed to have a negative effect on the model.

4.1.1 The model

To investigate my questions, I have derived a modified version of the gravity model used in Rose and Glick (2002).

$$ln X_{ijt} = \beta_1 + \beta_2 ln GDP_{it} + \beta_3 ln GDP_{jt} + \beta_4 ln POP_{it} + \beta_5 ln POP_{jt} + \beta_6 ln DIST_{ij} + \beta_7 BORDER_{ij} + \beta_8 EEA_{ijt} + \beta_9 EURO_{ijt} + \lambda_t + \varepsilon_{ijt}$$

$$(1)$$

The dependent variable $ln X_{ijt}$, represents Finland's export to country j in thousands of US dollars. The *ln* is the natural logarithm, *j* the importing country and *t* a year within the time period 1995-2014. The model includes more independent variables than just GDP and distance. We want to include more explanatory variables than in the original model in order to get more accurate results. The variable population is added to greater estimate the size of our country and the dummy variables help to identify more aspects of trade costs.

4.1.2 Variables explained

The dependent variables is, lnX_{ijt}, is as mentioned above represents Finland's exports. Below the independent variables are presented, explained and predicted.

GDP variables for Finland, $lnGDP_{it,}$ and for import countries, $lnGDP_{jt}$, represent the gross domestic product for the year *t.* The variables are predicted to have a positive effect on trade.

POP variables for Finland, $lnPOP_{it}$, and for import countries, $lnPOP_{jt}$, represent the total population for the year *t* for respective country. Keeping GDP constant, a larger population size is not to strive for as GDP per capita decreases. Therefore, predicted effect for these variables are negative.

The explanatory variable, $lnDIST_{ij}$, measures the distance between Helsinki and country *j*'s capital. The longer apart two trade partners are the higher the transport cost become. Distance is therefore predicted to effect trade negatively.

Moving on to the dummy variables used in the model, these variables are used to capture trade costs that the distance variable does not pick up. The first one BORDER$_{ij}$ takes the value 1 if Finland and country *j* share a border and 0 if they do not. The variable is predicted to have a positive effect as it indicates lowers transport costs. The dummy EEA$_{ijt}$ takes the value 1 if both Finland and country *j* are part of the preferential trade agreement The European Economic Area[7]. Trade agreement enhance trade as tariffs within the agreement are diminished. Finland being a member of the EEA should therefore benefit from this, we predict the variable to have a positive effect on trade. Followed by the variable the we are the most interested in, EURO$_{ijt.}$ The dummy takes the value 1 if Finland and country *j* share the common currency Euro and 0 if they do not. As mentioned in the chapter 3 (previous research) state that a common currency enhanced trade as transaction costs and uncertainty is removed. Thus the prediction for the Euro variable is a positive effect on trade. There

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[7] The European Economic Area (EEA) is an agreement between European Union member states and Norway, Iceland and Liechtenstein to create a single market for movement of goods, persons, services and capital without restrictions and tariffs. The agreement was formed January 1st 1994 (EU, 2015).

is also a set of time-fixed effects included, λ_t, this is a control variable that can captures things that are constant between countries but vary over time. Lastly we have ε_{ijt} which is the error term.

Through a multiple regression analysis, the coefficients for the variables are estimated to see if they are significant and how they differ from our predictions. The gravity model is estimated with the procedure Ordinary Least Squares (OLS) which minimizes the sum of squared errors from the model (Westerlund, 2005, p. 74). The continuous explanatory variables are logarithmic which is labelled with *ln*.

4.2 Selection of data

The trade partners that have been selected for this study are all high-income countries in the world and all the EU member states. However due to the data being incomplete a few countries have been eliminated. Resulting in a total of 1120 observations. The countries that had incomplete data were omitted because it was difficult to determine whether this was due to unregistered data or if the partners did not trade during these years. Therefore, the problem of taking the logarithm of zero for a country that is not trading with Finland can be eliminated since there are no zero's included in the continuous explanatory variables. However, this can come to affect our results negatively, as the bigger the sample the more reliable the results are (Dougherty 2011, p. 517) and this studies sample became smaller by eliminating data.

A list of countries that were used is presented in appendix A.1. The GDP and export data are collected from the World Bank Group[8]. Data about EURO and EEA are collected from the European Unions official website and the dummy variable has been created manually. The distance and border variable are collected from CEPII which is a site that collects data that is commonly used in gravity models (CEPII 2013). All values as GDP and exports were collected in USD no exchange rates have been used.

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[8] The World Bank Group is among other categories a databank that collects different topics of time-series data.

5 Empirical Results

This chapter presents the results from the regression, regression statistics and robustness checks.

5.1 The Euros effect on exports

The results from the regression are presented in the table 2 below. The table shows the regression coefficients for the independent variables. The constant is the value of the dependent variable lnX_{ijt} had independent variables been equal to zero. The constant is not presented in the table below as we only are interested in the variables. The continuous explanatory variables are as mentioned logarithmic which means that their coefficients are interpreted as elastic. That is, if you increase an explanatory variable with 1%, keeping everything else constant, what is the percentage effect on the dependent variable lnX_{ijt}. The coefficients for the dummy variables show how much higher the expected value for lnX_{ijt} is when the dummy is coded 1 in contrast to when it is 0.

The variable that is of greatest interest to us is the Euro dummy variable. Before we look at the coefficients we need to look at the p-values in order to see if there is a statistically significant effect on the dependent variable. The results are tested at significant level up to 10 %, this in order to avoid type I errors, where we reject a true null hypothesis and type II errors, the risk of accepting a false null hypothesis (Dougherty, 2011, p. 38). Looking at our results in table 2 in the column: Baseline regression OLS, we see that all the coefficients are significant at a 1% level. Three stars except for the dummy variable Euro that is not significant at all. The Euro dummy does not show statistical significance that the Euro is effecting trade which is what this study aims to find.

Table 2. Regression results

Dependent variable	lnX_{ijt} (a)	lnX_{ijt} (b)	lnX_{ijt} (c)
Variable	Baseline regression OLS	Coefficient OLS, EURO lagged$_{t-2}$	Coefficient OLS, EURO lagged$_{t-2}$, Controlling for time fixed effects
lnGDP$_{it}$	0,723*** (0,005)	0,739*** (0,004)	Omitted
$lnPOP_{it}$	-16,97*** (0,000)	-16,87*** (0,000)	Omitted
lnGDP$_{jt}$	0,783*** (0,000)	0,785*** (0,000)	0,783*** (0,000)
$lnPOP_{jt}$	0,293*** (0,000)	0,293*** (0,000)	0,295*** (0,000)
$lnDIST_{ij}$	-0,820*** (0,000)	-0,819*** (0,000)	-0,818*** (0,000)
BORDER$_{ij}$	0,806*** (0,000)	0,806*** (0,000)	0,802*** (0,000)
EEA$_{ijt}$	0,322*** (0,003)	0,352*** (0,001)	0,365*** (0,000)
EURO$_{ijt}$	-0,136 (0,256)		
EURO$_{ijt-2}$		-0,249** (0,043)	-0,275** (0,028)
Observation	1120	1120	1120
R^2			0,8615

The P-value is presented in the parenthesis. Note: lnGDP$_{it}$ and $lnPOP_{it}$ omitted because of collinearity.

* One-star significance if the p-value < 10%

** Two-star significance if the p-value < 5%

*** Three-star significance if the p-value < 1%

5.1.1 The Euros effect on exports lagged

The euro was introduced in 1999 but was not implemented into banknotes and coins until 2002. Therefore, the dummy variable is lagged with two years in order to find statistic significance in the variable.

$$lnX_{ijt} = \beta_1 + \beta_2 lnGDP_{it} + \beta_3 lnGDP_{jt} + \beta_4 lnPOP_{it} + \beta_5 lnPOP_{jt} + \beta_6 lnDIST_{ij} + \beta_7 BORDER_{ij} + \beta_8 EEA_{ijt} + \beta_9 EURO_{ijt\text{-}2} + \lambda_t + \varepsilon_{ijt}$$

$$(2)$$

Everything in equation 2 is kept the same except for the dummy variable Euro that has been lagged with two years. Running the regression with the new variable gives us the following results found in column (b): *Coefficient OLS, EURO lagged$_{t\text{-}2}$*. There is now a statistic significance in the Euro dummy and we can continue interpreting our results.

Starting with the explanatory variables GDP and POP. The GDP levels for both exporter and importers are positive as expected confirming that larger economies do trade more. The population variable *ln*POP$_{it}$ was predicted correctly for Finland a 1% increase in population will effect trade flows negatively. However not for the import countries which I had predicted. The coefficient shows that there would be a positive increase in trade flows if population is increased by 1% for the importing countries. In contrast to the distance variable which is negative and thereby confirms a correct prediction and the fact that distance increases trade costs and thereby affects trade flows negatively.

The dummy variables BORDER and EEA are statistically significant at a 1% level and confirm that they too increase trade flows. However, the dummy for common currency Euro is negative meaning that it does not increase trade flows for Finland. This goes against what I have predicted. A common currency should increase trade but the result show that the Euro's effect on Finland decreases trade.

The last years have been turbulent for Finland, not only did the 2008 financial crisis effect the economy, the Euro crisis has had its affect too[9]. Therefore, we want to include the fixed effect for time, λ_t, which captures unobserved heterogeneity that are constant between Finland and respective country but vary over time. In table 2 in the column (c): *Coefficient OLS, EURO lagged$_{t-2}$, Controlling for time fixed effects,* we find the results. The Euro variable is lagged with 2 years, and we have now taken into account the financial crisis and the Euro crisis by including the fixed time-effect i.e. the decline in trade has been accounted for and not thought as a result of the euro. The Euro dummy still shows that the Euro is affecting Finland's exports negatively, it is decreasing Finland's trade.

Table 3. Regression Statistics

Regression Statistics							
	df	SS	MS	F	Significance Sign. F	R Square	Observations
Regression	8	8372	1046	861,4	0	86%	
Residual	1111	1350	1,215				
Total	1119	9722					1120

Table 3 is used to study the variation of the data sample. Want we want to do here is study the F-value. This will tell us if the independent variables explain satisfactorily the variance in the depend variable. The F- value is equal to 861,4 and has a p-value of 0 we can reject the null hypothesis that the residuals only include randomised variations. Table 3 also tells us how well the independent variables explain the dependent variable. This is our R squared also known as the coefficient of determination, as you can see in the table R^2= 86% i.e. 86% of the outcome of the dependent variable can be explained by the independent variables.

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[9] The Euro crisis is referring to the what has occurred due to reckless fiscal policy in Greece, Italy, Spain etc. mentioned in chapter 2.

5.2 Robustness Checks

5.2.1 Regression diagnostic

To investigate the robustness of the regression we are going to test for multicollinearity, heteroscedasticity and autocorrelation in the model.

We want to test for multicollinearity because it will show us if the independent variables are independent of each other. If there is a connection between two or more variables we have what is called multicollinearity. Which means that our estimation parameter has a wide variety which indicates uncertainty (Westerlund, 2012). This will be measured through a model called Variance Inflation Factor (VIF) which I have calculated with the formula:

$$VIF_j = \frac{S^2_{xj} \, (n-1) \, SE^2_{bj}}{S^2}$$

(3)

S_{xj} = Standard deviation for each variable
SE_{bj} = standard error of the slope coefficient
S^2 mean square residual
n = number of observations

Table 4. Variance Inflation Factor results

	VIF
Intercept	
lnGDP$_{it}$	6,01
lnGDP$_{jt}$	9,58
lnPOP$_{it}$	5,92
lnPOP$_{jt}$	8,82
lnDIST$_{ij}$	2,17
Border$_{ij}$	1,09
EEA$_{ijt}$	1,63
EURO$_{ijt-2}$	1,53

As seen in table 4 our VIF values for GDP and POP are very high which is indicating that there is multicollinearity occurring in the regression. Our literature teaches us that a VIF value higher than 5 or 10 indicates collinearity (Westerlund, 2005). Therefore, we should consider removing a variable that might be the cause of this. In a further study it would be an idea to eliminate the population variable as it does not seem to be independent (Westerlund, 2005).

Further more we want to look at our error term, ε_{ijt}. We assume that the error term is homoscedastic in order for OLS to estimate the least square.

$$H_0 = \textit{homoscedastic error terms} \qquad H_1 = \textit{heteroscedastic error terms}$$

To test our hypothesis a Breush-Pagan (BP) test is conducted. The BP value is 40,68 and is significant at a 1% level means that we can rejected the null hypothesis of homoscedasticity error terms. We conclude that the alternative hypothesis holds and the error terms are heteroskedastic. This means that the error term is incorrectly specified. However, we want to confirm the presence of heteroscedasticity in order to avoid type I errors, we run a Whites test[10].

$$H_0 = \textit{homoscedastic error terms} \qquad H_1 = \textit{heteroscedastic error terms}$$

The F values is again significant at a 1% level. We can now safely reject the null hypothesis and state that there are heteroscedastic error terms in the model.

Next we want to see if there is any autocorrelation in the model. The Durbin-Watson[11] test to calculate the models D-values. The D-value can be anything between 0-4. Our D value is equal to 0,58 which indicate that there is autocorrelation. We need to correct for the autocorrelation and heteroskedasticity. The correction will be made by running our regression (2) with robust standard errors. The results are

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[10] Whites test is used to find heteroscedastic errors in the model (Westerlund, 2005).

[11] The Durbin-Watson test is a commonly used test to see if there is autocorrelation in the model (Westerlund, 2005).

shown in table 5, where we find the results to be the same expect for now all the variables are significant at a 1% level.

Table 5. Robust standard errors

Dependent variable	$\ln X_{ijt}$ (a)
Variable	Coefficients, with robust std. err.
lnGDP$_{it}$	Omitted
$lnPOP_{it}$	Omitted
lnGDP$_{jt}$	0,783*** (0,000)
$lnPOP_{jt}$	0,295*** (0,000)
$lnDIST_{ij}$	-0,818*** (0,000)
BORDER$_{ij}$	0,802*** (0,000)
EEA$_{ijt}$	0,365*** (0,000)
EURO$_{ijt-2}$	-0,275*** (0,000)
Observation	1120

The P-value is presented in the parenthesis. Note: lnGDP$_{it}$ and $lnPOP_{it}$ omitted because of collinearity.

* One-star significance if the p-value < 10%

** Two-star significance if the p-value < 5%

*** Three-star significance if the p-value < 1%

5.2.2 Regression analysis

To test the regression results again since the Euro dummy is still showing a negative effect we now narrow the import country sample. The results shown in in table 6 only includes EU member countries, with a total of 460 observations with robust standard errors.

Table 6. Regression with only EU-countries

Dependent variable	lnX_{ijt}
Variable	Coefficients, with robust std. err.
lnGDP$_{it}$	Omitted
$lnPOP_{it}$	Omitted
lnGDP$_{jt}$	0,946***
	(0,000)
$lnPOP_{jt}$	-0,108***
	(0,008)
$lnDIST_{ij}$	-1,295***
	(0,000)
BORDER$_{ij}$	0,028
	(0,659)
EEA$_{ijt}$	0,395***
	(0,000)
EURO$_{ijt-2}$	0,030
	(0,485)
Observation	460

The P-value is presented in the parenthesis. Note: lnGDP$_{it}$ and $lnPOP_{it}$ omitted because of collinearity.

* One-star significance if the p-value < 10%

** Two-star significance if the p-value < 5%

*** Three-star significance if the p-value < 1%

Running the regression with a smaller sample effected the results. The coefficients have all decreased substantially except for lnGDP$_{jt}$ who increased. The Euro dummy and the border dummy variable no longer show any statistical significance. This is an unlikely result. The highly unlikely results can be due to too few observations or that the independent variables are too similar too each other which is not unlikely since they are all EU member countries.

6 Conclusion and summary

The purpose of this paper was to answer two questions:
1. Has the Euro membership effected Finland's trade flows?
2. What conclusions can be drawn regarding Sweden's position on Euro membership?

Previous research and theory state that a common currency like the Euro should boost Finland's trade. However, when this correlation was studied this was not the outcome. The investigation showed a negative effect on trade. This was a surprising result, as a negative effect shows us that joining the Euro has actually decreased Finland's exports. However, Glick and Rose latest research did not either find a positive correlation between trade and a common currency suggesting that new investigation on this topic could lead to new findings. More research has to be done on the EMU and its effect on trade. In addition, when the sample was narrowed down to only EU member states, the Euro_{t-2} showed no statistical significance to effect trade. This however can be explained by sample data being too similar, causing collinearity.

There is a risk for incoherent results when large data samples are collected. Errors caused by the human factor has to be taken into consideration when processing and collecting the data. This is hard to detect as the data is collected from the World Bank which is considered a reliable resource. The more observations, the higher the chance of accurate results. In this study many countries where eliminated due to missing data which could be an explanation to the surprising result. Another explanation for the unexpected result could be the possibility of redundant explanatory variables. This was found when looking at the different VIF values, they were a borderline too high for GDP and POP. For a future study a larger sample is advised and using only GDP, instead of GDP and POP, could be the key to eliminating redundant variables.

However, it is possible that the Euro is causing a negative effect on Finland's exports. After the 2008 financial crisis, Finland's economy did not bounce back as fast as its neighbour Sweden. One could argue that this was due to the Euro. The Finish company Nokia was doing very well prior to the 2008 financial crisis contributing 3%

to Finland's GDP (Konjunkturinstitutet, 2012) but this declined after the financial crisis. Sweden suffered a likewise interference in their telecom industry during the financial crisis which caused the Swedish Krona to devalue against the Euro making Swedish exports cheaper for the Euro countries. This helped Sweden to gain back their competiveness. In order for Finland to achieve the same results with a common currency their real wages would have had to increase slower than the productivity in the relevant sector such as the telecom industry or for the Euro to devalue (Konjunkturinstitutet, 2012). Since this has not happened a slow increase in real wages is recommended. However, this is a time demanding process that has long-term effects. Another reason for why the Euro is effecting Finland negatively is that countries tend to trade the most with countries that are geographically near. The countries sharing borders with Finland do not have the Euro. The stronger the Euro gets the more expensive Finish exports become for the neighbouring countries, looking at it from this perspective it is no longer a surprise that the euro is effecting Finland negatively.

In conclusion based on my results found in this study I believe it has been an advantage for Sweden to have been outside the Eurozone. Obstacles created by the financial crisis and the unsolved Euro crisis give reason for more in-depth studies in order to determine the overall effect of the euro and for its individual member countries.

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Appendix

A. 1 List of countries included in the sample[12]

Andorra	Iceland	**Spain**
Antigua and Barbuda	**Ireland**	St. Kitts and Nevis
Argentina	Israel	**Sweden**
Australia	**Italy**	Switzerland
Austria	Japan	United Arab Emirates
Bahamas, The	Korea, Rep.	**United Kingdom**
Bahrain	Kuwait	United States
Barbados	**Latvia**	Uruguay
Bermuda	Macao SAR, China	Venezuela, RB
Brunei Darussalam	**Netherlands**	Equatorial Guinea
Bulgaria	New Zealand	Trinidad and Tobago
Canada	Norway	
Chile	Oman	
Croatia	**Poland**	
Cyprus	**Portugal**	
Czech Republic	Qatar	
Denmark	**Romania**	
Estonia	Russian Federation	
France	Saudi Arabia	
Germany	Seychelles	
Greece	Singapore	
Hong Kong SAR, China	**Slovak Republic**	
Hungary	**Slovenia**	

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[12] EU member states are in bold.