

EUROPEAN INTEGRATION: EFFECTS ON IMPORT AND EXPORT

Empirical Economics

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Contents

- Contents2
- Preface3
 - Literature on the topic3
- The Model3
- The Data4
 - Structure4
 - Foreign Trade Volume5
 - GDP6
 - Unemployment6
 - Dummy Variables6
 - Eurozone6
 - EEC7
 - EFTA7
 - EU-Member7
- Results8
- Conclusion10
- Appendix11
 - Former Model11
 - STATA Code13

Preface

The British Referendum on leaving the European Union was the first of its kind – but most European countries now have movements, which would also like to get out of the EU. Europeans are wondering if they would be better off without the union. The research question we want to answer is whether non-participation in European Integration policies, most importantly the common market, has notable influences on Import and Export or if going without the EU is more of a society policy issue.

Literature on the topic

The effect of the common market on the GDP has been discussed in great detail before important integration policies were executed, for example by Ingo Walter (1967) in *“The European Common Market: Growth and Patterns of Trade and Production”* or by Paolo Ceccini (1993) in *“Europa `92 - Ceccini Report”*. There has also been some theoretical discussion about the opportunities of third countries in the European Area, for example in Switzerland with Madeleine Höslis (1992) *“Teilnahme am EWR oder EG-Beitritt, Entwicklungen in der EG und ihre Rückwirkungen auf die integrationspolitischen Optionen der Schweiz”*. The lack of recent literature on the topic of whether European Integration is an economic decision or rather a societal inspired us to look into the data and to find out whether it influences trade volumes or not.

The Model

We estimated the impact of European integration policies and other key factors on import- and export-rates in a standard OLS model for 4 different time periods, to avoid time-series or paneldata. We chose the following models for our linear regression:

$$\begin{aligned} \ln(\text{foreign trade volume}) \\ = \beta_0 + \beta_1 \text{unemployment} + \beta_2 \text{gdp} + \beta_3 \text{efta} + \beta_4 \text{eec} + \beta_5 \text{eu} + \beta_6 \text{euro} \end{aligned}$$

The H_0 of homoscedasticity cannot be rejected due to the White Test and the Preusch-Pagan test in any of the time periods. So we did not use any robust or generalized regressions.

The regressors *eumember*, *eurozone*, *efta* and *eec* are dummy variables, which indicate participation in those policies. The first two are the main indicators for the level of European Integration, the second two for participation in the European common market. The GDP and the unemployment rate were included, since they are the main macroeconomic variables which influence Import and Export rates. We are aware that both those variables carry a reversed causality problem, but they are important for separating the influence of integration policies from overall economic performance influences.

The Data

Structure

Generally, our data is subdivided into four decades: the 1980s, 90s, 2000s and the 2010s. For every decade we took the mean of our regressors and the regressand, which also gives us a seasonal smoothing effect. The newest data is from 2014.

Foreign Trade Volume

The data for our regressand, foreign trade volume, was taken from the OECD online database. It is calculated by $trade\ volume = import + export$ and given in million US dollars terms. The following graphs show the development of the export and import (in % of the GDP to have a better overview) as a time series:

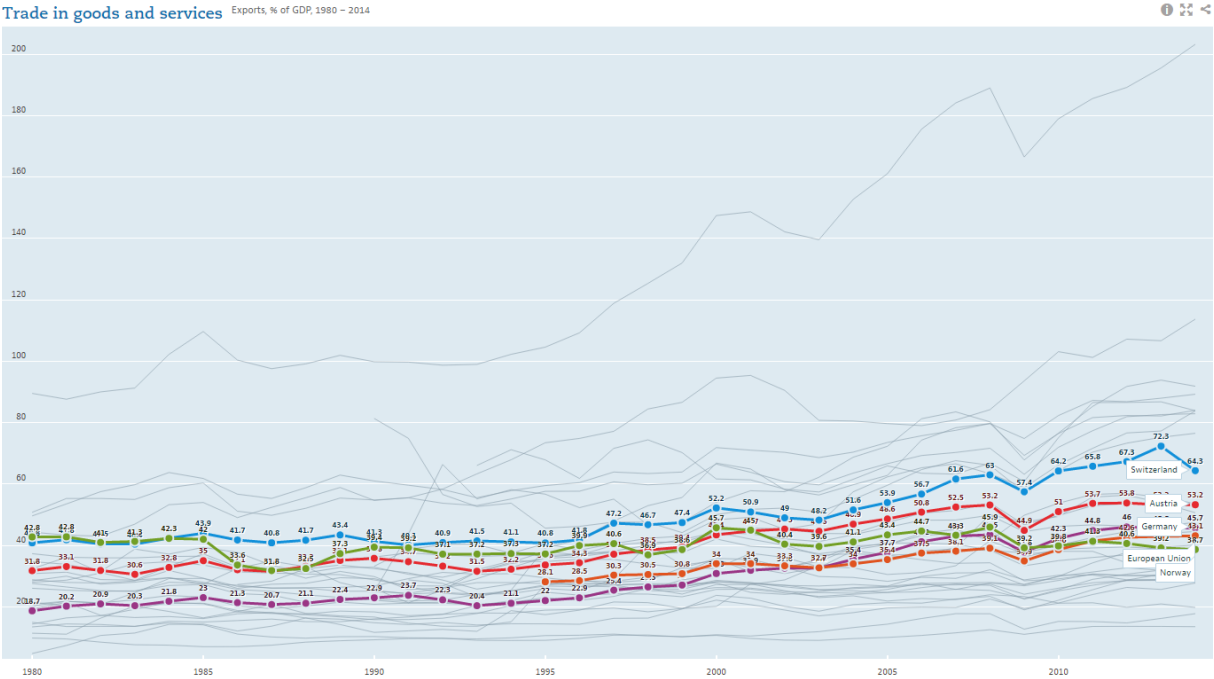


Illustration 1, Exports

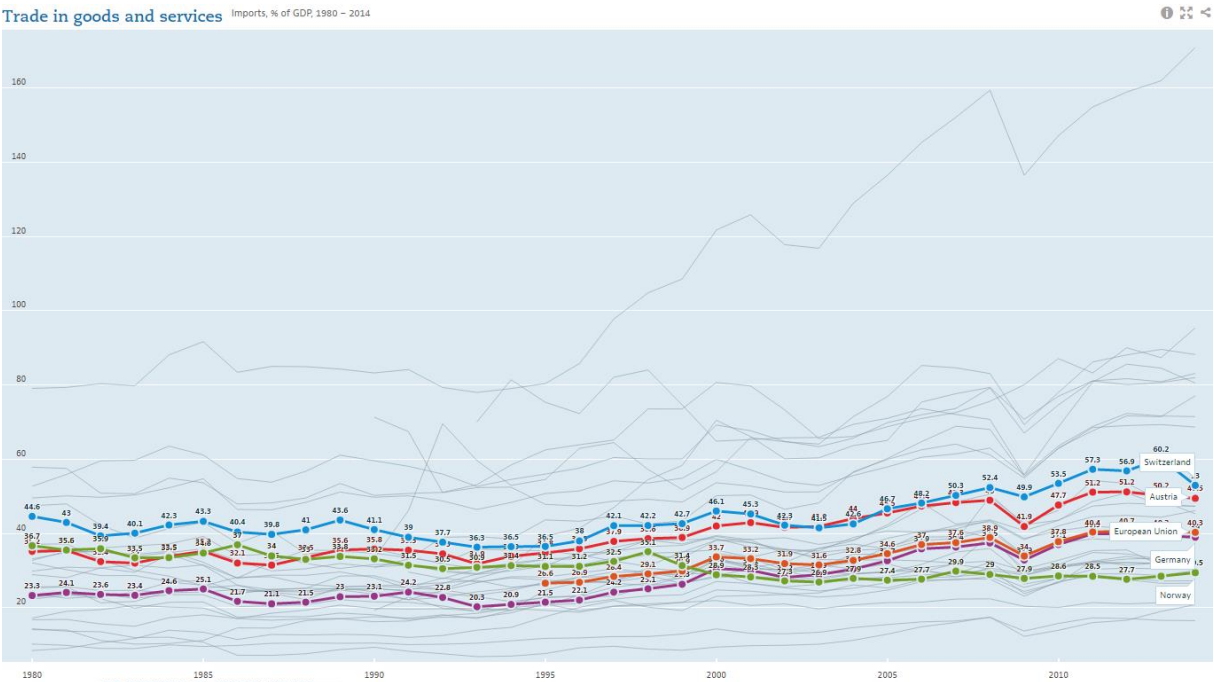


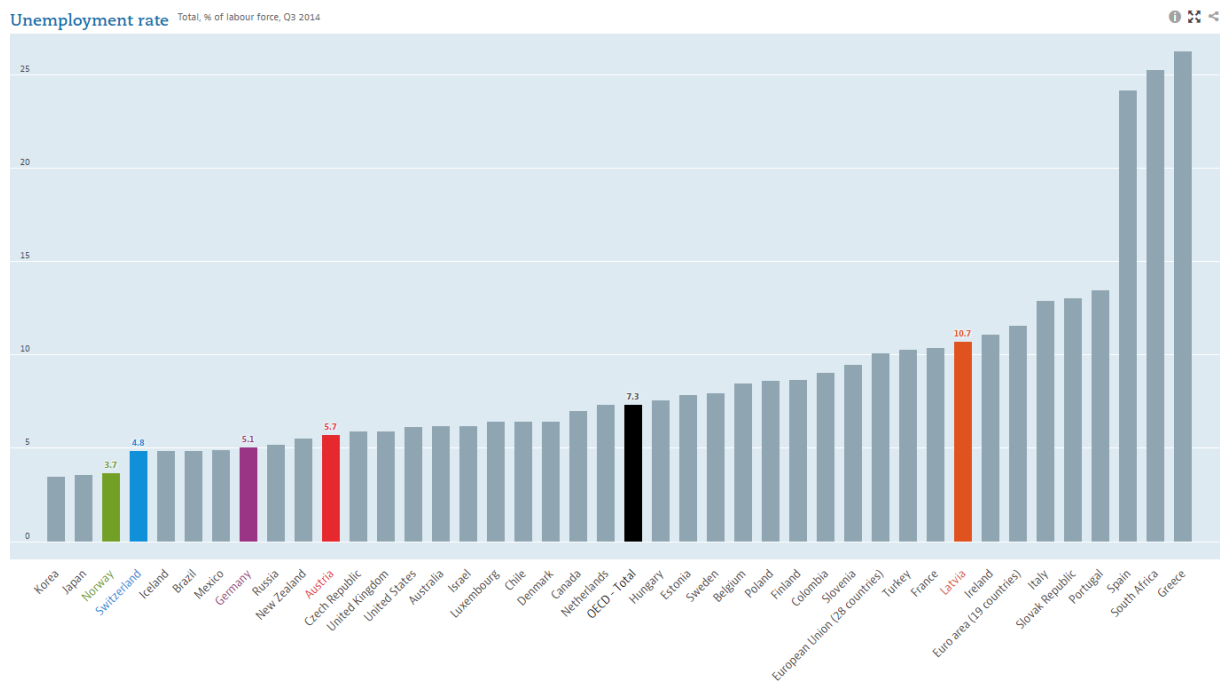
Illustration 2, Imports

GDP

The GDP data was taken from the OECD online database. Since our regressand is given in absolute terms we did not use per capita units here either.

Unemployment

The data for the unemployment rate was taken from the OECD online database. It is given as a percentual value.



Dummy Variables

Eurozone

The Eurozone was established in 2002 – today it has got 19 members, all of which are part of the European Union. This regressor takes on the value 1 if a county has the euro as their currency and the value of 0 if it has got any other official currency.

EEC

The EEC (European Economic Community) agreement is a forerunner from the European Union focusing on establishing a common market. It was also intended as a kind of “peace policy”, since countries participating in the common market now had better overview over military investments and upgrades by former enemy states. A 0 indicates non-participation in the EEC, a 1 indicates participation.

EFTA

EFTA (European Free Trade Associations) is an agreement of Non-EU-Members establishing trade agreements with the EU common market. As of now Switzerland, Norway, Iceland and Liechtenstein are part of the agreement. Again, a 0 indicates non-participation and a 1 indicates participation in this agreement.

EU-Member

The treaty of Maastricht was signed on the 7th February 1992, which marked the beginning of the European Union. The very narrowly defined EEC, which was focused on the common market and issues surrounding it, was now widened into a large-scale union. The most important laws of the EU are the 4 freedoms:

- (1) Free movement of goods
- (2) Free movement of services and freedom of establishment
- (3) Free movement of persons (and citizenship), including free movement of workers
- (4) Free movement of capital

These laws turned the EEC into a union with a new level of social, political and economic cooperation. A 0 indicates non-membership and a 1 indicates membership in the EU.

Results

After the first presentation of our model (the first model can be found in the Appendix), we expanded our model to include more European countries. There are two different Ordinary Least Squares outputs. One describes the model without any modifications on the regressors and the other one shows a OLS Model with a naturally log dependent variable (log-lin model).

Table 1

VARIABLES	0	80s	90s	00s	10s
		tradevolume	tradevolume	tradevolume	tradevolume
gdp	0.304	0.279***	0.00287	0.00778	
	(0)	(0.0317)	(0.00878)	(0.00813)	
emplo		5,432	15,363	-18,630	
		(4,791)	(21,112)	(14,513)	
eec		58,755	234,157	323,093*	
		(35,637)	(173,200)	(154,950)	
efta			307,386	315,801	
			(197,931)	(248,585)	
euro			112,798	149,360	
			(164,452)	(191,030)	
Constant	24,339	-56,329	-121,238	130,694	
	(0)	(52,283)	(208,289)	(220,257)	
Observations	2	14	25	26	
R-squared	1.000	0.907	0.262	0.264	
Standard errors in parentheses					
*** p<0.01, ** p<0.05, *					
p<0.1					

In our regression above without any modification, we cannot find any significance on any useable level except GDP in the 90s, which is intuitive, because the foreign trade volume is per definition a part of the Gross Domestic Product. We then ran a Breusch-Pagan Test and a White test on every regression to test for heteroscedasticity. We can't reject the H_0 , which means that we can't reject homoscedasticity. In the 80's and 90's we can observe a high R^2 , which is alarming, and in the 00's and 10's we find a small R^2 which looked more reasonable – but since the coefficients were not significant anyways, we did not investigate further.

Some variables were omitted due to multicollinearity; we had a look into the correlation table and found that "EFTA" is highly correlated with "EU-member", which is why STATA dropped some dummies.

Table 2

VARIABLES	80s ltrade	90s Ltrade	00s ltrade	10s ltrade
gdp	1.88e-06 (0)	1.26e-06*** (3.42e-07)	4.02e-08 (3.95e-08)	3.29e-08 (2.81e-08)
emplo		0.0424 (0.0517)	0.0638 (0.0950)	-0.0420 (0.0502)
eec		1.233*** (0.384)	2.060** (0.779)	1.816*** (0.536)
efta			1.370 (0.891)	0.745 (0.859)
euro			0.148 (0.740)	-0.351 (0.660)
Constant	10.75 (0)	9.436*** (0.564)	9.622*** (0.937)	11.37*** (0.761)
Observations	2	14	25	26
R-squared	1.000	0.771	0.444	0.391
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

In this regression we transformed the dependent variable with a natural logarithm. Surprisingly we got more significant coefficients as before in every decade. The Breusch-Pagan- and White-Tests could not reject the H_0 of homoscedasticity in any decade.

Our R^2 in the 80s and 90s are also really high, which is may be explained by a biased estimate, overfitting model or general trends. In the 00's and the 10's we can observe a smaller R^2 , which is more reasonable.

Some variables were still omitted. We again had a look into the correlation table and found that "EFTA" is highly correlated with "EU-member", which is the reason why STATA dropped some of our dummies. Since we wanted to use the same model in every decade, we let the dummies be automatically omitted.

The EEC-dummy is highly significant in almost every decade (the variable was omitted in the 80s regression due to multicollinearity) on every useable significance level, which may mean that the common market has an influence on the foreign trade volume. Employment has apparently no influence on our regression, which isn't really intuitive, but if we dropped this

variable the R^2 with the last two decades decreases greatly, which is why we kept the variable for its role as driving macroeconomic force.

A major reason for the popularity logarithmic models lies in the fact that logarithmic variables correspond approximately to the relative changes in the original variables. The coefficients in this log-lin model describe the variation in percentage to an increase of one unit from the explanatory variable to the dependent variable and our model did profit from this fact.

Conclusion

With the EEC-dummy being positive and significant in the three decades since the 1990s, we may assume that participation in the European common market has had a positive effect on import and export. In our model, being part of the EFTA did not have a significant effect at all, but we have to keep in mind that EFTA-participation always implies non-participation in the European common market (at least not in the most direct way). The omission of some of the dummies was not surprising, but since we wanted to use the same model in every decade, we still left them in. GDP and unemployment also had insignificant coefficients, but since they are key macroeconomic indicators and not the focus of our research we think that the model should still contain them.

So, yes, foreign trade does rise through the common market – but the decision whether to join or leave the EU or the common market will always have an enormous societal component and the decision will not only be made on the basis of the influences on foreign trade and GDP. Further research by sociologists might be needed to determine why societal aspects such as national pride or independence sometimes weigh more than macroeconomic indicators like import and export rates.

Appendix

Former Model

We also want to discuss the model we used before the presentation. The models

$$\begin{aligned} \text{import}_{per\ capita} & \\ &= \beta_0 + \beta_1 \text{unemployment} + \beta_2 \text{efta} + \beta_3 \text{eec} + \beta_4 \text{eu} + \beta_5 \text{euro} \\ &+ \beta_6 \text{monarchy} \end{aligned}$$

and

$$\begin{aligned} \text{export}_{per\ capita} & \\ &= \beta_0 + \beta_1 \text{unemployment} + \beta_2 \text{efta} + \beta_3 \text{eec} + \beta_4 \text{eu} + \beta_5 \text{euro} \\ &+ \beta_6 \text{monarchy} \end{aligned}$$

gave us separate estimates for import and export. We also did not include GDP, due to fear of reversed causality. There was also another dummy, monarchy (1 if the state is a monarchy), which we did not include in our final regression.

80s			90s		
VARIABLES	exportpercapita	importpercapita	VARIABLES	exportpercapita	importpercapita
employment	-170.4	-158.1	employment	-407.9	-45.43
	-297.1	-287.8		-501.4	-126
efta	95.38	-80.9	eu_member	18,341**	5,876
	-3,029	-2,934		-5,580	-3,938
eec	-1,123	-990.4	o.eurozone	-	-
	-4,015	-3,890			
monarchy	1,654	1,265	efta	-6,210	4,712
	-2,527	-2,448		-6,531	-3,725
Constant	4,422	4,443	eec	-17,596***	-3,328
	-2,664	-2,581		-3,886	-2,899
Observations	8	8	monarchy	-9,647*	553.4
R-squared	0.368	0.323		-3,795	-2,188
			Constant	8,101	2,034
				-7,726	-3,414
			Observation s	11	13
			R-squared	0.88	0.503
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

00s			10s		
VARIABLES	exportpercapita	importpercapita	VARIABLES	exportpercapita	importpercapita
employment	-266	-199.6	employment	-0,062	-3,171
	-416.4	-334.7		-1,330	-1,542
eu_member	-1,770	-388	o.eu_member	-	-
	-11,277	-9,064			
eurozone	9,183	6,834	o.eurozone	-	-
	-6,745	-5,422			
efta	4,228	2,332	o.efta	-	-
	-11,363	-9,133			
eec	-7,460	-5,009	o.eec	-	-
	-5,726	-4,602			
monarchy	7,978	5,411	monarchy	-20,071*	-15,003
	-4,774	-3,837		-6,382	-7,398
Constant	8,659	7,423	Constant	47,074*	38,900*
	-11,555	-9,288		-11,190	-12,972
Observations	15	15	Observations	5	5
R-squared	0.545	0.473	R-squared	0.839	0.693
Standard errors in parentheses			Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1			*** p<0.01, ** p<0.05, * p<0.1		

The only significant regressors we could find using this model were “EU-member” and “EEC-member” in the regression on export in the 90s – this was the decade in which the EU was established and a lot of countries with high overall economic performance joined. But note that the coefficient of “EEC-member” is negative and almost as high as the coefficient of “EU-member”. Also, the coefficient of the monarchy dummy was significant in the 1990s and 2010s, which we believe to be pure chance.

Interesting is the high R^2 in every regression. We may say that our estimation has an impressive Godness of Fit, but this fact should be handled with caution. This result can be described as “overfitting”, because there might be too many explanatory variables.

The most inexplicable result is the insignificance of every coefficient in our regression with “export per capita” as explanatory variable. No matter how we changed the model, we could not see any significance in “export per capita” as an explanatory variable. Either there is no

causality to export with the given variables or the amount of observations was too small in our project.

STATA Code

Code of the final model:

80s:

```
gen ltrade = ln(tradevolume)
reg ltrade emplo gdp efta eec eu euro
estat hettest
outreg2 using reg_results, excel
clear
```

90s:

```
gen ltrade = ln(tradevolume)
reg ltrade emplo gdp efta eec eu euro
estat hettest
outreg2 using reg_results, excel
clear
```

00s:

```
gen ltrade = ln(tradevolume)
reg ltrade emplo gdp efta eec eu euro
estat hettest
outreg2 using reg_results, excel
clear
```

10s:

```
gen ltrade = ln(tradevolume)
reg ltrade emplo gdp efta eec eu euro
estat hettest
outreg2 using reg_results, excel
clear
```