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Investigating the relationship between European integration and the economic growth of the EU member nations

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Abstract

This paper investigates the relationship between European integration and the economic growth of the EU member nations. The data incorporates 39 countries over 65 time periods which were extracted from the Penn World Table. The model used is adopted by Henrekson et al. (1997) while some adjustments have been made to it in order to suit this paper better. Several regressions were run before determining that the iterated Weighted Least Squares model is the most accurate with this data. The iterated WLS model estimates the EU effect to be 1.458% of GDP growth. The model did not find EFTA to be statistically significant and found the EA to have a negative effect of −0.731% on GDP growth. Possible explanation for the EFTA not being statistically significant is a bias in the data, while the explanation for the negative effect of EA is most likely attributed to the economic state of member states.

Contents

1. Introduction

The creation of the European Union (EU), as we see it in its current form, began after the Second World War. With the continental history full of war between neighbouring countries, a new age of technology had made the continuous prospect of such wars a devastating threat. Therefore, the first steps of uniting Europe were made. From 1950, the European Coal and Steel Community (ECSC) begins to unite countries both economically and politically. The first members to join and ratify the ECSC through the Treaty of Paris (1951) were France, Italy, West Germany and three Benelux countries (Belgium, Luxembourg and Netherlands). This treaty would unite the production of steel and coal, removing production competition between the countries and help promote the growth of economies. The treaty would create a common market, where the members would have the ability of trade without the imposition of tariffs, grounding unification and influencing the price through pooling of resources. The same members of the ECSC would go on to create the Treaty of Rome (1957) which become known as the European Economic Community (EEC). The EEC saw to further integration through the reduction of custom duties and the creation of multiple pillars of the current European Union. The EEC proposed the creation of Common Agriculture Policy (CAP), Common Transport Policy (CTP) a Customs Union and the establishment of the European Commission (EC). In the following decade this treaty would go on to promote economic growth to its members due to trade liberation, food security through the CAP and an authority establishment for the union. The CAP takes effect by "*giving the countries joint control over food production. Farmers are paid the same price for their produce.*" (European Union, 2019), which satisfied the food needs of the members. (European Union, 2019). Through the customs union, the members remove all customs duties between each other, while harmonizing duties to outside members, creating the world's biggest trading group. In the period of 1963-1973, the 6 members of the ECSC had a healthy average growth of Gross Domestic Product (GDP) per capita of 4.1% (The World Bank, n.d.). From here, a question of whether the integration of European Union (EU) countries has led to a positive economic growth for these nations. The importance of investigating such a relationship is due to the effects it would have on a larger scale.

Economic growth is one of the determinants of the standard of living and as a nation experiences higher growth so will its citizens benefit from increased wealth and better social benefits such as pension funds and better healthcare. In addition to this, investigating the European Union and its relationship with economic growth might provide incentives for potential new members that are considering applying for membership. This would be a two-sided benefit for both the new members and the EU; new members could benefit from an integration induced growth, boosting their economy while the EU would benefit from enlargement to gain a better trading position on the international scale and increased funds for its internal processes. While the EU does have short-term benefits as evidenced from pre-accession growth of potential members, as a result of “aim to establish functioning markets with a robust private sector… the liberalisation of administered prices, the removal of restrictions on foreign trade and capital movements and the privatisation of state enterprises.” (Mira, 2001) and following the accession, the eligibility for the EUs internal aid programmes. However, is there growth over a longer period? In this dissertation I will investigate the European Union integration and its long period effects on economic growth.

In order to investigate the relationship empirically, I will adopt a model by Henrekson et al (1997) from the paper “Growth effects of European integration”. The paper investigated the effects of regional integration on economic growth in the European Community (EC) and the European Free-Trade Association (EFTA). The paper is relevant to this project due to the nature of investigating economic growth within the European Union. The point of interest in using the adopted model will be the dependent variable of Gross Domestic Product (GDP) growth and the significance of the EC, EFTA and EA membership dummy variables. The model will differ by using panel data on 31 countries which make up for the EC and EFTA community, with the time period starting from the year 1950 and ending in 2014. Such model’s time period will allow the incorporation of the most recent and the biggest enlargement of the EU up to present date. With this data, I hope to confirm and continue the work of Henrekson et al. (1997), by confirming long-term significance for the EC/EFTA membership while getting empirical proof for the economic growth effects.

The structure of this paper will be the following: Section 2 will review the literature which already exists concerning this topic. Section 3 will give an overview of the dataset used in this paper. Section 4 will introduce the model used in this paper along with the adaptions made to fit this paper, from there it will continue with the testing of the method and analyses concerning the significance of the results. Section 5 will analyse the results obtained with the model and provide hypotheses for why such results were obtained. Lastly, Section 6 will conclude the whole paper.

2. Investigation of growth as effect of European integration

Taking a neoclassical theory perspective, the Solow (1956) growth model- long-run growth effects cannot be generated; instead, a static one-off increase in growth can be found due to increases to variables Capital (K) and Labour (L) which have constant returns to scale and Technology (T) which is constant over time. As the theory predicts, increase in growth does not translate over into long-run effects, as in the long run the variables eventually grow at a constant rate (rate of population growth). In accordance to this Campos et al. (2018) have estimated that economic and political integration into the European Union have increased per capita European incomes by an average of 12 per cent, "with substantial variations across countries, enlargements as well as over time". The authors state their empirical motivation to be due to a "disappointingly small" literature offering estimates of EU monetary benefits such as increases in per capita Gross Domestic Product. The paper attempts to construct robust estimates of economic integration benefits in terms of growth and productivity effects with recently developed methodology of synthetic counterfactuals. The paper measures the actual growth rate by creating a synthetic group of countries. These synthetic countries have in common, the fact that they never joined the European Union. The paper also adds their own methodological contribution by using "a difference-indifferences approach to address one of the main drawbacks of the synthetic counterfactual method, namely the difficulty of estimating confidence intervals for the counterfactual effects". This paper provides a recent investigation into the effect of integration for member states and brings out the effect of EU on per capita income.

Continuing from the perspective of the Solow-Swan model, Henrekson et al. (1997) start their paper on the effects of integration on economic growth by referencing the traditional growth model (Solow) which states: "there can be no permanent effect of economic integration ". The authors back this claim with the Cecchini Report of 1988, which predicted a once-off effect on income from EU integration while forgoing any long-run effects. In contrast to the Cecchini Report, the paper immediately references advocates in favour of regional integration (RI) who do claim that RI has long-run growth effects. The authors state the "vital importance to investigate empirically whether any permanent effects on the growth rate as a result of regional integration can be detected". The paper breaks down previous investigations into smaller steps and gradually builds up to their own improved model for investigation. They find that membership of European Commission/European Free Trade Association (EC/EFTA) have exhibited a growth of 0.6-0.8 percentage points. The paper uses a model that incorporates data after integration has taken place to remove the effects of initial resource allocation, in addition to including several control variables to separate direct and indirect effects of integration. The paper also pointed out that in addition to integration affecting static efficiency, further regional integration through the launching of the internal market, could be growth-enhancing in the long run. The results of the paper suggest the technology transfer to be the main mechanism through with EC/EFTA membership affects growth, while finding no effect of the membership on investments. In contrast, Badinger (2001) criticises the use of dummy variables and proxies for EC/EFTA memberships and enlargements and points them out to be “rather poor proxies for the complex and continuous process of integration of the EU countries”. The paper improves its model with real integration by considering the removal and harmonisation of tariffs between EU members and non-EU countries. The paper also proposes an ideal measure of positive integration but states the large scope of it to be too big for this paper. The paper finds that, there is strong evidence of growth increase following integration but did not find permanent growth effects of integration as referenced by Henrekson et al. (1997). Regardless of the fact, the paper found an average of 0.4 growth rate per annum in the period of 1950 to 2000 from which the bulk of the effects could be contributed to technology-led growth. The paper also concluded a small role for integration-induced investment-led growth but mentioning that the full potential has not been fully exploited mainly due to the bureaucratic nature of the European Union. Both papers heed that while their results were statistically significant, some measure of caution should be exercised with the degree of accuracy of the results as they are just estimates. The study by Mann (2015) aims to quantify the effect of joining the EU to provide measure to the wave of Euroscepticism following the recent and frequent financial and economic crises. The paper points out two growth models (Solow and endogenous) which could be used to measure the effect of European integration on GDP growth. The paper states the intention of quantifying the effect of European integration using a Solow growth model by carrying out a panel data analysis. The paper also builds on its difference from previous studies by focusing its data on central Eastern Europe (CEE) countries, citing that now there is enough data available to make an apt conclusion. The author finds a relatively small yearly growth, but if aggregated over years it becomes substantial. The paper goes on to make an argument for European membership for CEE countries. However, the author warns about these results and adds that there are some economic benefits, such as lowered risk premiums due to being in a club of developed countries with stable institutions, from the integration process that are not captured in the analysis, and if these factors were considered in the analysis, the growth rate of CEE countries would increase further. Continuing with the focus on CEE countries, the paper by Chistruga and Crudu (2016) evaluates the impact of EU integration on the competitiveness of countries which joined during the 2004 and 2007 EU enlargements. The paper researches economic indicators, such as Current Account to GDP ratio, which can provide conclusions on the EU funding's effectiveness on industrial development and competitiveness of the new member states. The authors find that the integration into EU by the new member states has significantly increased the country's business environment along with economic infrastructure. The joining of EU lead to business activity acceleration and increased attractiveness of the country on the international markets.

Analysing to the perspective of integration via convergence of income in EU member states; the study of Crespo-Cuaresma et al. (2008) discusses the economic consequences of the European Integration over the past 60. The paper poses the question "Have per capita income levels in the European countries converged towards each other since the 1960s?". The paper critiques several previous studies on the subject on growth by proposing that the data could be improved by using a different technique of looking at the issue of convergence within the integrated European economy with a panel data method. The paper builds on the fact, that while previous papers have included also non-European countries as controls, in this paper, they will solely focus on current EU member states. They find that "EU membership has a positive and asymmetric effect on the long-term economic growth." The paper also adds that the results point to less developed countries benefiting most from access to broader technological framework from the regionally integrated unit. In this line, Kutan and Yigit (2007) investigates growth through the framework of productivity and real convergence by deriving a stochastic endogenous growth model. The paper specifically focuses on knowledge spill-overs and to do that, the paper measures changes in technological capabilities and productivity. The study builds on Rivera-Batiz and Romer's (1991) hypothesis that integration will lead to pooling of knowledge and technology and uses it to extend the work of Lee et al. (1997). The paper tests their model using a range of structural break tests and data envelopment analyses. The authors mention on improving previous studies on the topic by removing proxy variables. One way they achieve this is by creating an integration parameter to isolate effects of integration, therefore extrapolating permanent and temporary effects of integration. The results of the paper find improved rates of productivity growth in addition to overall growth due to capital accumulation. The study concludes saying that some institutional aspects of the EU, such as Structural and Cohesion Funds, help the recipient countries in the long run by allowing them to catch up to core EU 15 members.

Summing up, the literature about European integration agree that there are benefits from this process in terms of higher GDP growth and variables such as knowledge and technology which themselves lead to GDP growth. However, there are differences in methodologies of investigation and the heterogeneity of results result in a non-unanimous that agreement whether there are long term effects of integration. Few studies find no long-term effects from integration while other studies find that through proxy and benefits of a larger competitive market, companies are incentivised to invest in research and development (R&D), which leads to higher and longer growth.

3. Database

The data used in this paper consists from the Penn World Table. The PWT is a large database, which covers 182 countries between 1950-2014. The databased is composed by Feenstra et al. (2015). The original model composed by Henrekson et al. (1997), contains only data that is limited to the 1990s. Therefore, one of the objectives of this paper is to provide further research into the European integration and economic growth by considering a wider time range from the previous research. The data in this paper will start from 1950, that is the same decade the first foundations of the current European Union was established (EEC), and will continue until 2014, which would include all of the enlargements. This timeframe should be able to incorporate the biggest EU enlargement and provide results, as to the effect of the EU based on this model to the eastern-European countries. The dataset used in this paper will incorporate 39 countries, out of which 31 are countries belonging to the EU and EFTA and 8 countries which are selected from different parts of the world with different GDPs as a control (Canada, United States of America, Mexico, Chile, China, Japan, Korea and Australia). There are 8 variables in the model including the dependent variable and 3 dummy variables, which are presented in appendix A. The dependent variable will be the output growth of an economy and the independent variables will be output per capita, years of schooling with returns to education, gross fixed capital formation as a share of GDP, real exchange rate distortion, EU dummy, EFTA dummy and EA dummy. As seen in appendix A, with respect to the chosen five variables, the standard deviations for GDP growth and GFCF are quite small, indicating the difference between countries and time periods are close to the mean value. While for the variables SCHOOL, RERD and Y_0 the standard deviations are quite large, indicating a bigger difference in mean values between countries and time periods. In these statistics, the most notable outlier is the huge variation in the maximum value of RERD compared to its mean value. The shown maximum value occurs in the database for Croatia in the year 2000. It is the result of inflation change of -0.008% and a change of exchange rate of 1.1, therefore with the used method giving a huge value in the real exchange rate distortion.

4. Model

4.1. Foundation of the model

This paper will adopt and slightly modify a model by Henrekson et al. (1997). Due to more recent enlargements and a larger data pool, the paper will use a new data panel to make a regression which will look at the growth as a result of EU integration. The model will be the following:

$$GROWTH_{it} = \alpha + \beta_1 Y_0 + \beta_2 SCHOOL_{it} + \beta_3 GFCF_{it} + \beta_4 RERD_{it} + \beta_5 EU + \beta_6 EFTA_{it} + \beta_7 EA + \mu_i + e_{it}$$

Where *i* denotes countries and *t* denotes time where: $i = 1, 2, 3, \ldots N$; $t = 1, 2, 3, \ldots T$

Where GROWTH denotes average growth rate of real gross domestic product per capita, Y_0 is average real gross domestic product (GDP) for controlling the level of development, $SCHOOL_{it}$ is the years of schooling and returns to education to control for human capital, $GFCF_{it}$ is gross fixed capital formation as a share of GDP. EU_{it}, $EFTA_{it}$ and EA_{it} are dummy variables equalling to 1 if the country is an EU, EFTA or EA member and 0 if it is not a member state. $RERD_{it}$ is a measure of the real exchange rate distortion to control for trade policy. μ_i is a country-specific time invariant effect and e_{it} is the error term, which captures growth inducing effects not added in the regression.

The countries selected for this panel data will include all the 28 members of the current European Union members, 3 EFTA members and the addition of 8 countries outside of Europe. The time period used in this model ranges from 1950 to 2014. Within this time period there are some unobserved statistics, most notably the Baltic countries for which the data starts at 1990 as a result of being a part of the USSR, along with a few other Eastern-European countries which will result in this being an unbalanced panel. Regardless of the absence of some data, the model should still be able to capture results from the aforementioned countries from the available time range.

In respect to the original model and the construction of the variables by Henrekson et al. (1997), this paper makes some changes due to data availability. For example, Henrekson et al. (1997) for the variable SCHOOL used Barro (1991) data on 1960 values for school enrolment into secondary and primary levels. For this paper, the data is taken from Feenstra et al. (2015), where the data is constructed based on mean years of schooling and returns to education. The inclusion of human capital is recognized as a driving force of growth. Mankiw et al. (1992) in their paper "A contribution to the empirics of economic growth" support the inclusion of human capital for cross-country data, saying it provides an "*excellent description*". As well, author Yih-Chyi Chuang in his paper "The Role of Human Capital in Economic Development: Evidence from Taiwan" found that "*human capital accounts for 46% of output growth in aggregate manufacturing industry and from 23 to 84% of that in two-digit industries."*. Therefore, the inclusion of human capital should serve as an important factor in investigating and measuring growth with the current panel data. Another change involves the variable RERD, for which the data was taken from Dollar (1992) who composed the Real Exchange Rate Distortion (RERD) by dividing the actual price level by predicted price level. Due to the accuracy uncertainty of replicating results of the Dollar RERD measurements for the chosen time period, a different method is used in this paper. An attempt is made to obtain similar results to RERD by using the data from Feenstra et al. (2015) and obtaining the RERD through dividing the growth rate of exchange rate with the growth rate of inflation. This method should serve as a viable alternative to the method used by Dollar. The inclusion of RERD is chosen as a result of controlling for trade policy, more precisely "*captures the effects of trade policy in general, and enables us to distinguish growth effects attributable to regional integration as opposed to general trade effects.*" (Henrekson, et al., 1997). While the impact of trade barriers on GDP growth is something that has had a lot of debate, the general consensus has formed to be that more outward economies do benefit from fewer trade barriers on the international scale. The 2001 OECD report states "*open trade and investment regimes provide the best opportunity for wider (and informed) consumer choice and better quality products*", which could be used as an argument of benefiting from open trade. In support of this view, the paper by Frankel and Romer (1999) did find that "*trade raises income. The relation between the geographic component of trade and income suggests that a rise of one percentage point in the ratio of trade to GDP increases income per person by at least one-half percent*". In presence of these claims, it should be reasonable to account RERD as a potentially significant variable into the model.

4.2. Model analysis

In order to analyse the relationship between variables used in the model, a correlation analysis will be carried out.

Table 1. Correlation matrix

	Ygrowth	*Y_0*	*SCHOOL*	*GFCF*	*RERD*
Ygrowth	1				
Y_0	0.066	1			
SCHOOL	-0.184	-0.138	1		
GFCF	0.226	0.265	-0.028	1	
RERD	-0.024	-0.025	0.013	-0.018	1

Source: Author calculations on database described in appendix A

From this matrix, it can be seen that the correlation between the dependent variable (Ygrowth) and rest of the independent variables is relatively small. The dependent variable is in strongest correlation with Gross Fixed Capital Formation (GFCF) r=0.226, while in the least correlation is the independent variable SCHOOL r=-0.184.

From this table 1 and by the Pooled Ordinary Least Squares regression ran with the program Gretl, there is an indication of a potential multicollinearity problem between the variables Ygrowth and Y_0. This is due to the opposite signs obtained for Y_0 with respect to Ygrowth under the correlation matrix and pooled OLS regression. Although, this can be tested by running a correlation analysis on the regression. The results obtained from doing a collinearity analysis in Gretl indicate no multicollinearity problem. In the analysis, Variance Inflation Factor values for each independent variable over 10 would indicate a collinearity problem, but the results of the analysis stay under 10 (appendix B). Therefore, we can reject the notion of a multicollinearity problem.

4.3. Results of the Initial Model

The objective of the model is to determine whether the European integration (reflected by the dummy variables EU/EFTA/EA) have an impact on the economic growth of the member nations (reflected by Ygrowth) and if yes, to which degree of influence. The model is regressed in the program Gretl and will use a pool Ordinary Least Squares (OLS) model. The model contains all the variables specified above and the data from 39 countries in a stacked time series between periods from 1950-2014. Results will be measured with at a 95% confidence level.

Due to the data having an unbalanced panel data characteristic, the results are regress based on 1449 out of 2535 observations.

Based on the first model run in Table 2, initial results show that all the variables besides EU are significant at least to the 0.1 level. But in order to test the validity of all these results, I will run a heteroskedasticity groupwise test to check for a heteroskedasticity problem. This test gives the results as: p-value = 2.564e-115. Meaning there is a heteroscedasticity problem in the model. In order to improve the results, I will use robust standard errors in the model.

In the second model in Table 2, the test is a Pooled OLS with robust standard errors. The model's adjusted R^2 = 0.276 displaying an explanatory power of 27.6%. The model is statistically significant (p-value= $7.38*10^{-12}$), although the only variables significant at the 0.01 level are SCHOOL (p-value = 0.0008) and GFCF (p-value = 0.0001). In this Pooled regression, the EU, EFTA and RERD variables are not statistically significant. Given the use of a panel data, the Pooled OLS might not be the optimal choice for running a regression, therefore a Breusch-Pagan test will be used for considering Pooled OLS in favour of random effect model and in the case of rejection, the Hausman test for considering a random effects model in favour of fixed effects model.

Breusch-Pagan test will have the following hypothesises:

H_O = Pooled OLS model is adequate, in favour of random effects alternative.

H_A = Pooled OLS model is inadequate, random effects alternative is favourable.

Running the Breusch-Pagan test in Gretl, we get the following results: p-value = 2.510e-009.

Since the obtained p-value ($2.51*10^{-09}$) is lower than a p-value of 0.05, we reject the null hypothesis at .05 level and conclude that a random effects alternative is favourable over pooled OLS.

Hausman test will have the following hypothesises:

H_O = Random effects model is consistent, in favour of the fixed effects model.

H_A = Random effects model is inconsistent, fixed effects model is favourable.

Running the Hausman test in Gretl, we get the following results: p-value = 0.0113623

Since the obtained p-value (0.0113623) is lower than a p-value of 0.05, we reject the null hypothesis at .05 level and conclude that a fixed effects model is favourable over random effects model.

Based on these results, it can be concluded that in order to improve the model, a fixed effects model is the optimal choice in running a regression with the given data.

4.4. Improved Fixed Effects Panel model

Improving on the previous OLS regression, a different method of fixed effects regression will be used to get a better and more accurate result in terms of the variables.

From table 2, running the 3rd model of Fixed effects, the obtained results appear to be statistically significant but again I test for heteroskedasticity. Running the groupwise heteroskedasticity test in Gretl, the p-value comes back as 0, indicating a heteroskedasticity problem, which will be improved by running a new model with robust standard errors.

In the fourth model in Table 2, the test is a Fixed effects with robust standard errors. The Fixed Effects model's Adjusted $R^2 = 0.367$ displaying a goodness-of-fit of 36.7% within the panel units. From the initial results, it could be concluded that this model is an improvement from the last Pooled OLS model. In this regression, two variables are statistically significant at the 0.01 level (SCHOOL and GFCF) two variables are statistically significant at the 0.05 level (EU and Constant), EA is significant at the 0.1 level and the variables RERD and EFTA are not statistically significant. The model contains no collinearity.

In order to test for the presence of autocorrelation, the Durbin-Watson (DW) statistic test will be used.

Based on the test ran in Gretl, the results are the following:

Durbin-Watson statistic = 1.50557, p-value = 1

As the p-value is 1, with this we can conclude, that there is no serial correlation problem in the model.

In order to further explain the accuracy of these results, I will run a Pesaran CD test for cross-section dependence. This test will allow me to determine whether a shock in one country in the dataset will also influence another country in the dataset.

Running the Pesaran CD test in Gretl, the following results are acquired:

Test statistic: z = -4.953113,
with p-value = P(|z| > -4.95311) = 7.3e-007
Average absolute correlation = 0.189

These results tell us that there is a cross-sectional dependence in the dataset.

Running the groupwise heteroskedasticity test in Gretl, the p-value comes back as 0, still indicating a heteroskedasticity problem, even with robust standard errors.

Based on the low values of the Pesaran CD Test and the groupwise heteroskedasticity test, we can conclude that the Fixed effects model is not optimal, and a Weighted Least Squares model could be more accurate in representing the results of the data. This is due to WLS taking into account cross-sectional dependency and therefore should yield better results.

4.5. Final Weighted Least Squares Model

For the final model (Table 2, models 5 and 6) I use a Weighted Least Squares model. I will run two models, one with iterations and one without iterations. As an omitted variable problem does not appear to be present, the iterated model leads to more accurate results and therefore will be used in the analysis section of this paper.

Table 2: GDP Growth Models

VARIABLES	(1) Pooled OLS	(2) Pooled OLS	(3) Fixed Effects	(4) Fixed Effects	(5) Weighted Least Squares	(6) Weighted Least Squares
Constant	2.635***	3.525*	19.741***	19.741**	24.783***	26.356***
	(0.939)	(1.850)	(4.644)	(8.270)	(6.295)	(6.059)
Y_0	-3.89e-07**	-3.32e-07	-	-	−1.68e-05***	−1.77e-05***
	(1.54e-07)	(2.05e-07)	-	-	(4.77e-06)	(4.72e-06)
SCHOOL	−1.395***	−1.720***	−7.455***	−7.455***	−5.018***	−5.272***
	(0.252)	(0.468)	(1.439)	(2.616)	(1.274)	(1.207)
GFCF	0.231***	0.236***	0.290***	0.290***	0.247***	0.236***
	(0.026)	(0.055)	(0.030)	(0.063)	(0.028)	(0.027)
RERD	−0.036*	−0.036	−0.038**	−0.038	−0.024	−0.023*
	(0.019)	(0.023)	(0.017)	(0.0236)	(0.014)	(0.014)
EU	0.075	0.206	1.519***	1.519**	1.539***	1.458***
	(0.281)	(0.487)	(0.438)	(0.579)	(0.354)	(0.340)
EFTA	−1.312***	−0.927	−0.0048	−0.0048	0.372	0.435
	(0.373)	(0.639)	(0.676)	(0.748)	(0.491)	(0.457)
EA	−0.819**	−1.078**	−0.812**	−0.812*	−0.773***	−0.731***
	(0.358)	(0.436)	(0.410)	(0.476)	(0.299)	(0.283)
Observations	1449	1449	1449	1449	1449	1449
Countries	38	38	38	38	38	38
Min periods	14	14	14	14	-	-
Max periods	55	55	55	55	-	-
Sum squared residuals	27462.03	21023.83	18987.61	18987.61	1397.048	-
LSDV R-squared/Adj.R^2	0.089	0.276	0.367	0.367	0.435	-
S.E. of regression	4.344	3.890	3.749	3.749	1.017	-
HGW Test	2.564e-115	-	0.000	0.000	-	-
DW Test	-	-	1.000	1.000	-	-
Pesaran CD Test	0	1.05e-06	7.3e-07	7.3e-07	2.81e-06	4.53e-04

Source: Author calculations on database described in appendix A

Note: Models 2-6 have been controlled by time dummies. Model 5 and 6 have been controlled by unit dummies. Model 2 and 4 robust standard errors used. Model 6 iterations used (convergence achieved after 13 iterations). *** Significant at 1%, ** Significant at 5%, * Significant at 10%

5. Analysis

In the final Weighted Least Squares model, there are six variables which are statistically significant at the 0.01 level out of the eight used, which are Y_0, years of schooling and returns to education, gross fixed capital formation, European Union membership, Euro Area membership and the constant. One variable, which is statistically significant at the 0.1 level is RERD. Lastly the variable, which is not statistically significant is European Free Trade Association membership. Based on the model, it could be concluded that the variable of interest (EU) from the selected 39 countries, influences the economic growth of a country. Interestingly, the dummy variable EFTA, which signifies the membership to the European Free Trade Association, did not appear to be significant in relation to the GDP growth of a country. In the case of dummy EU, having a membership (EU=1) is expected to increase GDP growth by 1.458%, holding all other variables constant.

Based on the analysis of the model, it could be said that the research question has a partial answer: European integration has had a positive influence on the EU member states. But based on the results, out of the EU and EFTA variables, only the EU variable turned out to be statistically significant. Although in the previous literature by Henrekson et al. (1997), there was found to be no difference between EU and EFTA. In this model the variable EFTA has a negative coefficient although it is not statistically significant, therefore no conclusions on the effect of EFTA can be made. Therefore, the result should be interpreted carefully, and the author of this paper does not claim the insignificance of being a part of the European Free Trade Association. Potential explanations for such findings could be the presence of a bias in the data.

Another integration describing variable which was added into the model is the Euro Area dummy. From the final model, the variable describing the membership of the Euro Area, i.e. countries that have adopted the Euro as their national currency, shows a negative correlation of -0.73% GDP growth, holding all other variables constant. Meaning the adoption of the Euro should attribute to negative growth. Yet, the author of this paper believes that this negative growth could be displayed because of the countries in the database. The results could be skewed to show a growth of -0.73% as an effect of adopting the Euro, but a bigger suspect is the position of the economy at the moment of joining the Euro Area. Meaning that due to the strict requirements set on the eligibility of adopting the Euro, most countries that reach that stage, are already big and strong economies. This could be exampled by some of the countries that have adopted the Euro: Finland, Belgium, Germany, France. Therefore, a likely explanation could be that the adoption of the Euro doesn't necessarily reduce growth, but at the point where most countries are eligible for the Euro, their economies are already developed and at the point where growth is no longer the same as a developing economy could have.

Another interesting finding in the results is that one unit increase in schooling and returns to education is expected to decrease GDP growth by -5.272%, holding all other variables constant. This finding is in contradiction to some empirical and theoretical literature (Barro (2001), Salgür (2013)). Barro, in his paper "Education and Economic Growth" finds that there is a positive correlation between years of schooling and economic growth. More precisely, he writes that "*the average years of school attainment at the secondary and higher levels for males aged 25 and over has a positive and significant effect on the subsequent rate of economic growth*". He goes on to estimate the coefficient for years of schooling to have an impact of 0.44% per year on the growth rate. Salgür in this paper on "The Importance of Education in Economic Growth" goes on to list the most important factors which are benefitted from increased educational rates that have influence economic growth. Salgür states "*The relationship between education and economic growth was based on the idea that the main advantage of more schooling is that a better educated human capital means and entails an increased level of labour productivity*.". He also goes on to point out that one of the indicators of this correlation is that "*developed countries with high economic growth have good human capital with higher standards of schooling strategies*". One explanation to the obtained results could be a correlation measured by the model that is explained by a paper written by Dellas and Koubi (2003). Their paper holds the title of "Business cycles and schooling" and studies the cyclical patterns of schooling, where they found the pattern of schooling to be mostly countercyclical. The authors of the paper found that "*People are more likely to attend school during bad aggregate times (when it becomes harder to find work and/or wages are relatively low).*", while also finding evidence that "*schooling decisions are negatively related to changes in the real interest rate*.". The findings of this paper do provide some logical explanation as to why the model is displaying a negative relationship between GDP growth and years of schooling. One possible explanation therefore, could be the increase in schooling during recessions or periods where the GDP growth is shrinking due to natural business cycles or during economic shocks. Therefore, the author of this paper suggests that the negative correlation between schooling and GDP growth is most likely attributed to the tendency of returning to school, during periods when there is low GDP growth. The results should not be translated as higher levels of education leading to lowered growth.

In the final model, the results for gross fixed capital formation come as a positive coefficient which is statistically significant at the 0.01 level. More accurately, the relationship seems to be that a 1 unit increase in GFCF will increase the GDP growth by 0.236 units. Such results are also found in the paper by Gibescu (2010), where it was found that "*The obtained results show a direct and strong connection between economic growth and gross fixed capital formation*". These results would confirm the importance of GFCF in economic growth.

In this paper the research question was to investigate the relationship between European integration and economic growth in the EU member states. Based on the findings of the model, there is evidence of a positive correlation between EU membership and economic growth reflecting an increase of 1.458% in GDP growth. As mentioned above, some degree of caution should be used in the interpretation of this model as the results of the variable SCHOOL are in contradiction to previous empirical and theoretical literature along with a suspected bias in the data, influencing the accuracy of impact of the European Free Trade Association.

6. Conclusion

In this paper, I have investigated the relationship between European integration and economic growth. In doing so, I used 39 countries for my base, out of which 31 are EU/EFTA members and 8 of them are non-members put in as a control. The final panel data model is done with iterated Weighted Least Squares which accounted in for the cross-sectional dependency present in the data. I used three dummy variables to investigate the effects of integration and found the most important variable EU to hold a positive effect of 1.458%, while in the final model being statistically significant at the 0.01 level. I also found EFTA membership to be not statistically significant. The reason for this could be a bias in the data that is not allowing a good capture of its effects, therefore no conclusion on the EFTA could be made. Additionally, I also found the Euro Area to have a negative membership with GDP growth of -0.731% while being statistically significant. This result could be the due to the countries included in the dataset and not represent the negative value of being in the EA. The hypothesis following this is that the EA incorporates developed countries where the growth rate is no longer as sizeable as the growth rates of some developing countries therefore displaying a negative correlation with GDP growth. The model as well as rest of the variables were all statistically significant.

The main conclusion of this paper should be the affirmation of a positive relationship between European integration and economic growth. The models have shown a statistically significant estimation of the impact European integration has on the economic development on its member states. In order to further this research, the effects of the Euro Area should be investigated further using different techniques and dataset in order to find out the real impact of the EA. While also investigating the growth effects of years of schooling and returns to education, as in this paper it appears the results are contradicting some theoretical and empirical works, although they provide a backing to the theory of countercyclical pattern for schooling.

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Appendices

Appendix A

Descriptive statistics of the database

Variables in the model	**Observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
Ygrowth (%)	2135	3.958 %	0.049	-31.852 %	37.285 %
Y_0	2174	$6.82*10^5$	$1.43*10^6$	4874	$8.2*10^6$
SCHOOL	2174	2.704	0.552	1.111	3.734
GFCF (% of GDP)	1591	23.859 %	0.049	5.388 %	45.515 %
RERD	1694	0.095	5.507	-19.942	192.534

Source: (Feenstra, et al., 2015)

Appendix B

Collinearity test on the variables used

```
Variance Inflation Factors
Minimum possible value = 1.0
Values > 10.0 may indicate a collinearity problem

          Ym    1.183
      SCHOOL    1.073
        GFCF    1.190
        RERD    1.002
```

Source: test run in Gretl