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European Integration, Economic Growth and Convergence

An Analysis of EU Membership Implications on Long Run Growth

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Abstract

The economic role of the European Union is ever more questioned around the continent and is driven forward by increasingly popular political powers in various European countries. This study attempts to analyse the economic implications of the EU membership on member states, and if effects of varying extent can be observed for different parts of the union. It is observed that in the short run, there is a slightly negative effect on growth, possibly as a result of certain initial costs associated with the membership. The results conclude however that significant positive and increasing effects on economic growth, due to EU membership, can be determined in the medium to long run for Eastern European countries as well as for member states with relatively lower GDP per capita. There was no significant evidence suggesting likewise for Western European countries and those with relatively higher GDP per capita.

Keywords: Convergence, Economic Growth, European Union, Mean Group Estimator, Panel Data, Regional Integration

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Abbreviations

ANDEAN	Andean Subregional Integration Agreement
CACM	Central American Common Market
CEAO	Communauté Economique de L'Afrique de L'ouest
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
EC	European Community
ECSC	European Coal and Steel Community
EEC	European Economic Community
EFTA	European Free Trade Association
EMU	Economic and Monetary Union of the European Union
LAFTA	Latin American Integration Association
RIA	Regional Integration Agreement
RTA	Regional Trade Agreement
SACU	South African Customs Union
SADC	Southern African Development Community
UDEAC	Customs and Economic Union of Central Africa

1. Introduction

With the ongoing Brexit process and tendencies of rising Euroscepticism, the discussion of the European Union's legitimacy and role in Europe is becoming increasingly important. As critical movements of power want to decrease the influence of EU or in some cases even dissolve the entire union, others want to take the integration both further and deeper. The European debt and refugee crises shocked the union rigidly, and the consequences of this have been visible in the outcome of the European elections. A clear rise in Eurosceptic parties and politicians have been observed in the European Parliament, and a wide gap of varying opinions has been created throughout Europe (De Vries, 2018). Studies regarding the effects of the EU are henceforth of great essence and interest in order to comprehend the question of benefits and costs of membership.

Initially being a peace-project in the aftermath of World War II, the EU gradually developed into being an economic and political union working to promote economic growth and ensure prosperity for the continent as a whole. The establishment of a common market with free movement of goods, services, people and money is a flagship for EU's ambitions to promote domestic growth for member states. These are set out to promote trade, the spread of technological knowledge, human capital and cross border-collaboration stimulating growth throughout the union (Kierzenkowski, 2016). In addition to this, there are Cohesion Policies set up to promote growth by reducing the economic discrepancies existing between member states (Yeşilada & Wood, 2016). There is a large portion of studies treating the potential costs and benefits of the EU, not at least in relation to the United Kingdom's exit of the union.

The aim of this paper is to investigate the effect of membership on countries' economic growth by regression analyses. Membership in the EU provides access to the common market, removal of trade barriers and facilitates for exchange of knowledge and technology to name a few. Based on a theoretical framework, it is thus expected that this integration will have positive growth effects on member states. Also, stronger effects are predicted to show for less-developed countries as these enjoy benefits from the Cohesion Policies to a larger extent, as well as with regards to the theory of convergence (Barro and Sala-i-Martin, 1992). It is contributing to the existing literature by examining and highlighting the significance of the length as an EU-member, i.e. the effects of how long a country has been a member. To do this, the dependent variable is, instead of a mere membership dummy, the number of years as an EU member. This will hence test for the long-term effect of being a member, and the potential positive effects EU

will have the longer a country has been a member. Among the previous research, Cuaresma (2008) is conducting the most comparable study by similarly examining the time as an EU member's effect on member states' growth. Apart from an updated study, this paper stands out by using a mean-group estimator model, obtaining some different measurements results which provide other interpretations. Additionally, an Eastern European split sample is analysed in order to examine potential differences in effects between Western and Eastern European countries, according to the former divisions of the Cold War.

A set of control variables commonly used when testing for growth effects are included, which will be presented further on in the paper. To check for varying effects on growth between countries with different economic characteristics, split samples are created, firstly dividing the data set into Western and Eastern European countries and secondly into the richest and poorest halves according to GDP per capita. The regression model is then run separately for these samples, with expected outcome being that stronger growth effects can be observed for the less-developed countries.

The paper is hereafter structured in the following way: The first section will cover the background of European Integration and the history of the European Union, followed by the relation between economic growth and regional integration and lastly context of the socio-economic inequalities within the EU and the Cohesion Policies. Further on a previous studies section goes through the existing literature on Regional Integration Agreements (RIAs), and specifically European Integrational effects on economic growth in member states. A data and methodology section then describes the data used as well as the model and the specifications. The results are thereafter presented and analysed, followed by a final section providing a conclusion.

2. Background

2.1 European Integration

The integration of Europe began at the post-World War II era in the end of the 1940s and beginning of the 1950ies. A war-thorn Europe was seeking for collaboration and unity in order to reconstruct the ruined continent. Consequently, the European Coal and Steel Community (ECSC) was established in 1950, and the first steps towards European unity and a future union were taken. The six founding countries to first integrate into the community were Belgium, France, Germany, Italy, Luxembourg and the Netherlands. In 1957, an essential next step was reached as the Treaty of Rome established the common market in the shape of the European Economic Community (EEC), (European Union, 2019).

The first enlargement then took place at the beginning of the 1970s as Denmark, Ireland and the United Kingdom joined what had then become the EU. A mutual parliament on a European level further on gained more influence, and direct elections of the members were being applied. An EU regional policy set out to financially support poorer areas in terms of job-creating and regional infrastructure investments. The next enlargement named *the Mediterranean enlargement* occurred as Greece, Spain and Portugal joined in the 1980s. The Single European Act of 1986 set the basis for free trade within the union, and the ‘Single Market’ was hence established (European Union, 2019).

This was later on elaborated in 1993 as the ‘four freedoms’ were being put to place, which is the free movement of goods, services, people and money. A third enlargement became a fact in 1995 as Austria, Finland and Sweden got their membership statuses. The introduction of a common currency, the Euro, at the beginning of the 21st century marked an essential milestone in European integration. A major enlargement took place between 2004 and 2007 as 12 Eastern European countries became EU members. As the 2010s commenced, the EU was equipped with new modern institutions and strategies as the Treaty of Lisbon was signed by all members. The 28th member of the union was incorporated as Croatia joined the EU in 2013, and the integration of Europe thus reached a level of unity and cooperation never witnessed before in the history of the continent (European Union, 2019).

2.2 Regional Integration and Growth

The unification of Europe was firstly and mainly set out as a peace-project, but gradually developed into a union with many goals and ambitions, not at least to spur growth for Europe

as a whole. The single market and the regional policies are examples of reforms created to stimulate and boost growth in EU member states and distribute the wealth to poorer regions in order to promote growth across the entire union. Regional integration and economic growth are being discussed frequently in economics, and there is both theoretical and empirical evidence suggesting it to boost capital accumulation, productivity and economic growth. Badinger (2005) presents an AK growth model in the shape of a simple Cobb-Douglas production function.

$$Y = AK^\alpha L^{1-\alpha}$$

with technology (A), output (Y), capital (K) and labour (L)

Positive regional integration effects on growth are then argued for due to scale effects in human capital. Referring to examples of Romer (1990), Grossman and Helpman (1991) and Aghion and Howitt (1992), Badinger states that the growth rate of knowledge (being progress in technology) is dependent on the level of human capital employed in the sector. It is then argued that this is related to regional integration, as this would imply an enlargement of the economy and henceforth an increase in the level of human capital. Badinger hence states that permanent growth effects from regional integration can be theoretically traced back to this production function in the R&D sector (Badinger, 2005).

The benefits come from opening trade, the spread of knowledge, financial integration, the stability of institutions, common market, macroeconomic stability and less volatility of exchange rates (Conti, 2014). Financial integration, in particular, has proven to be stimulating economic growth as it creates the capacity to spur factor productivity through increased efficiency of resource allocation, as well as facilitating the access to investments (Edison et al., 2002; Gehringer, 2013; Giannetti et al. 2002). A desired benefit of integrating a region, as in the case of the EU, implies facilitating and promoting *Foreign Direct Investment (FDI)* as well as *Research and Development (R&D)*, which in turn stimulates economic growth. Gao (2005) studied this relationship and provided significant and positive effects of integration on both these factors, which also lead to enhanced growth. The role of the regional policies in promoting growth has been examined and shown to have positive effects, in particular after certain reforms regarding the structural funds in 1988. This suggesting that regional financial support and distribution of wealth across the union fulfil its purposes (Cappelen et al., 2003).

Integration has further proven to be fruitful for stimulating growth also in other regions. Various regional cooperation projects in Africa have been successful in fostering growth. Studies regarding *the Common Market for East and Southern Africa (COMESA)*, *East African*

Community (EAC) and *Southern African Development Community* (SADC) found positive associations between the levels of integration and the regional economic growth (Kamau, 2010). In West Africa, the *Economic Community of West African States* (ECOWAS) studies have shown tendencies of a convergence club, where per capita income has converged among member countries implying a more stable and continuous growth throughout the region (Jones, 2002). Furthermore, studies found that the monetary union within ECOWAS, *the West African Economic and Monetary Union* (WAEMU), had additional positive effects on trade and economic growth for those countries sharing the same currency (Anyanwu, 2003). The association between integration and growth have thus proven to be positive in many cases, and the theoretical framework is to a large extent suggesting so. Even if there are studies proposing otherwise, it is generally noted that integration stimulates and spurs more competitive markets with positive technological spillovers as a result. These factors are henceforth main aspects in integration leading to higher growth (Peretto, 2003).

2.3 The Social Divide and EU Cohesion Policy

The EU is in relative terms consisting of developed countries. There are nonetheless disparities both between countries within the union but also within members states themselves. Not at least did these inequalities unfold as many of the Eastern European countries joined during the 2000s, as well as after the European debt crisis commencing in 2009. In Eastern Europe, per adult income was around 35 % lower than the European average in 2017. In Southern European countries, heavily affected by the 2008-2009 financial crisis, the per adult incomes showed to be 10 % lower than the general average in 2017. On the other side of the table, studies have shown countries in Northern Europe to be about 50 % wealthier than the average European country. Additionally, almost all European countries did not succeed in fulfilling the United Nations Sustainable Development Goals inequality target during the period 1980-2017. This objective states that the bottom 40 % of a population should grow faster than the average. However, since the beginning of the 2000s, there are signs suggesting that countries of Europe have improved at distributing wealth and promoting growth to these bottom income groups (Blanchet et al., 2019).

The problems of socio-economic disparities existing within the union is approached by the EU through the Cohesion Policy. Its goal is to financially support the less developed regions in the EU through redistribution of wealth and thus reduce these economic, social and territorial gaps existing within the union. The Cohesion Policy is with its €351.8 billion budget for 2014-

2020, the EU's main investment policy. It makes up nearly a third of the total EU-budget and is set out to promote job creation, business competitiveness, economic growth, sustainable development, and improve citizens' quality of life all throughout the region, with special focus to more deprived areas. Studies have shown that GDP per capita in the period of 2007-2010 increased in the poorest regions of the EU from 60.5 % of the EU-average to 62.7 %. The policy invests heavily in financial aid towards small- and medium-sized enterprises as well as start-ups, not least in poorer regions in order to stimulate growth. According to European Commission reports, infrastructure investments during 2007-2012 led to an additional 5 million EU-citizens gaining access to broadband connectivity, 3.2 million citizens accessing modernized water supply facilities and an increase of 1 200 km of roads and 1 500 km of railway across the Union (European Commission, 2014). Most econometric studies on the topic show, albeit small, but positive results of the Cohesion Policy's effect on regional growth in less developed countries specifically. It thus plays an essential role in reducing the economic inequalities of the union (Pieńkowski and Berkowitz, 2015).

3. Previous Studies

The effects of integration on economic growth have been studied from both a regional and global perspective in various papers during the past decades, as political and economic integration has gradually been increasing worldwide. The results and conclusions have varied greatly throughout the literature, as well as the methodologies and measurements of integration. De Melo et al. (1992) examined the effects of integration on growth and investments in various parts of the world. The sample is split into two groups consisting of OECD and developing countries. Regional integration is further on looked at in several constellations, namely the European Community (EC) and European Free Trade Association (EFTA) for OECD countries and Andean Subregional Integration Agreement (ANDEAN), Central American Common Market (CACM), Communauté Economique de L'Afrique de L'ouest (CEAO), Latin American Integration Association (LAFTA), South African Customs Union (SACU) and Customs and Economic Union of Central Africa (UDEAC). Cross-country growth regressions were conducted, and the effect of integration was measured via a dummy variable indicating being a member or not. The authors then applied initial GDP per capita, a human capital measure and rate of investment as control variables. Apart from SACU, all dummy variables reflecting membership in an RIA showed no significance. Hence no growth effects from integration were principally captured. Landau (1995) compares the effects on growth on EEC-countries with non-EEC countries. Also here, no significant difference in growth between the EEC- and the non-EEC countries could be concluded.

However, Coe and Moghadam (1993) found a significant impact of European integration on French economic growth when using time series data and cointegration analysis. Even evidence for accelerating integration boosting the growth effects in France was found. Further on, Baldwin and Seghezza (1996) also have contrasting findings to De Melo et al. (1992), with significant and positive results of foreign R&D on domestic TFP (Total Factor Productivity). The authors could thus see larger effects from R&D investments on TFP in EU-members than in non-members, implying positive growth effects from European integration. Another influential work showing positive economic growth effects from European integration was done by Henreksson, Torstensson & Torstensson (1997). From the traditional Solow growth model, and various OLS regressions including different control variables, they found significant results on EC and EFTA memberships' impact on countries' economic growth.

Vamvakidis (1999) compared broad liberalization to simply joining an RTA, with the results that liberalizing broadly achieves substantially larger growth effects than just simply taking part in an RTA; where the latter even showed negative effects for some specifications and thus questioning the method of simply using a membership dummy variable to measure integration effects on economic growth. Similarly, Madani (2001a and 2001b) challenges this technique of measuring the effects of integration. The paper examines the effects of ANDEAN and ASEAN RIA's on industrial growth, with non-significant results on the membership dummy variables. Berthelon (2004) continues to argue against solely using dummy variables of membership to study the effects of an RIA. Berthelon argues it would imply that it is the signing of an agreement itself which would lead to certain effects, which is non-realistic. The potential effects of RI would take place in a longer perspective, after the implications of the agreement have had time to be absorbed and have an impact. The paper instead uses measurements of absolute and relative RIA. Using these measurements allow for estimations that take into account essential characteristics that may have an impact on growth effects, which are disregarded when just using dummy variables. In the case of Berthelon, it focuses not simply on being a member of an RIA but also considers the size of the countries' economies and thus the level of integration. Berthelon tests the estimations when using dummy variables and reaches the same conclusions as much of the previous work; that the membership dummy variables do not produce significant results. However, when using the measurement variables presented above, the results are both positively significant as well as providing evidence that the larger the countries with which agreements are signed, the greater the impact on growth effects will be. Berthelon thus enforces the significance of reaching beyond the method of dummy variables estimations to measure regional integration effects on growth, and rather include measurements which better capture the essence and characteristics of integration.

Badinger (2005) introduces a variable measuring integration through the degree of protectionism. The data consists of 15 EU members states over the period of 1950-2000. Badinger rejects the null hypothesis of permanent growth effects. However, results still suggest that GDP per capita of these EU15 would be about one fifth lower at the time of the study if no integration had taken place since 1950.

Cuaresma et al. (2008) also get positive results regarding EU-membership effects on long term economic growth. The regression uses the number of years as an EU member as the independent variable and includes an openness control variable to check for effects that could occur due to increased intra-trade. The results suggest that these effects differ and there is thus a positive effect from growth solely due to regional integration and the exchange of

technological knowledge among members. A split sample dividing the data sets into subgroups of poorer and richer countries shows differences in the effects. The regression results from these different samples suggest that less developed EU-countries with lower GDP per capita benefit to a greater extent from EU-integration. A possible explanation for this is presented as the financial aid to the poorer regions of the union. Mann (2015) focuses on Central Eastern Europe and the effect on growth from European integration, in this particular region. An integration variable, constructed by dividing trade with EU27 by total trade, is set as the independent variable, showing positive effects on medium-run economic growth. The benefits on growth are not substantial on a yearly basis, but over several years the results suggest stronger and significant effects. As stated in Cuaresma et al. (2008), the less developed regions hence seem to benefit from European integration significantly. Most recently, Campos et al. (2018) used a synthetic control method in an attempt to estimate what the level of per capita income and productivity would be, have not the country been a member of the EU. The authors find that per capita GDP and labour productivity significantly increased with EU membership in Ireland, the United Kingdom, Portugal, Spain, Austria, Estonia, Hungary, Latvia, Slovenia and Lithuania. A lesser effect, but still mostly existent effect was shown for Finland, Sweden, Poland, Czech Republic and Slovakia. Only Greece showed negative results from EU membership. These findings yet again confirm the heterogeneity in the country-specific outcomes from EU membership.

The literature regarding growth effects from EU membership and European integration is hence not quite coherent. However, the methodologies differ greatly, and more recent studies have moved away from using simple dummy membership variables, and instead find or construct other independent variables measuring European integration. Much recent literature however seems to find positive effects on growth in the medium to long-run, as well as indications of the less developed regions (mainly Eastern European countries) benefiting the strongest from the integration that joining the EU implies.

4. Data and Methodology

4.1 Data

All data for the 28 EU member states were gathered from the Penn World Table Database version 9.0, stretching over a time span of 1950-2014, with yearly data being applied (Feenstra et al., 2015). The variables gathered were GDP per capita, population, the share of investment in GDP, a human capital index and year of EU-entrance. From this yearly data, all variables were accordingly constructed. Some missing data are to be found prior to 1989 in many Eastern European countries. This is likely a consequence of lacking data availability during some of these time periods due to the Cold War and the division of the Iron Curtain. In comparable studies, such as Cuaresma (2008), data covering 10-year periods are used to better examine long-term growth effects and to avoid cyclical changes. Albeit advantages using periods of five or ten years when avoiding cyclical fluctuations such as inflation, interest rates and public spending, this paper uses yearly data when analysing the growth effects from membership. The decision to use of yearly data originates from the fact that some countries in the data set have not been members for a long time period and using data of five to ten years periods would simply imply lack of observations for these countries. As cyclical fluctuations can have short-term effects on growth, this must be taken into consideration as the data is yearly and growth rate hence calculated on a yearly basis. However, as long-term growth effects can be observed for those countries with a long history of EU membership, the assumption is that similar trends can be expected for countries with shorter time periods as members of the EU.

4.2 Variables

Economic Growth

The dependent *growth* variable was constructed by taking the logarithm of the GDP per capita and subtracting it by the logarithm of the lagged GDP per capita. To see the impact of EU-integration on growth, this variable is thus tested to check for possible significant effects from other variables.

Years in EU

By subtracting each year with a country's year of entrance, and then replacing the value with zero if the year is less or equal to the year of entrance, a variable showing how long a country has been a member of the EU was constructed. The longer a country has been a member, the larger this value becomes and thus, the greater the integration should be for this country. With

this reasoning, it is consequently set as the independent variable to measure the length of being an EU-member's effect on countries' economic growth. Further on the variable is squared to check for medium to long-run effects.

Share of investments in GDP

Share of investment is a common variable to use when testing for growth effects and is principally standard for all empirical studies on economic growth (Cuaresma et al., 2008). It is useful as a control variable as it is expected to be highly significant and have a positive effect on growth.

Human Capital

The human capital variable is taken directly from the Penn World Table Database and reflects an index based on years of schooling and returns to education (Feenstra et al., 2015). A human capital control variable is also commonly used due to it being generally associated with a country's economic growth (Cuaresma et al., 2008).

Population Growth

Due to its empirically significant and negative impact on economic growth, population growth rate is a suitable control variable, as well as frequently used in the literature (Levine & Renelt, 1992). It is simply constructed by taking the logarithm of the population data and subtracting it with the logarithm of the one period-lagged value; $\ln(Pop) - \ln(Pop_{L1})$ for each year and country.

Gap Ratio

Lastly, a convergence variable is included in the form of a GDP gap between each country and each year's richest country in the data set. It is expected to show a negative relationship with growth, due to expected economic convergence between EU-member states (Monfort, 2008) and the theory of convergence (Barro and Sala-i-Martin, 1992). For each year and country, the GDP per capita is divided by the maximum GDP per capita value of that specific year, thus creating a GDP per capita gap ratio convergence control variable.

4.3 Model

As described, the sample consists of economic disparities between the observation countries and heterogeneous results can be expected. Thus, a mean group (MG) estimator model allowing

for heterogeneity was applied. The MG estimator first estimates each country's coefficients on an individual level, and further on takes the average of all these individual estimates resulting in the Mean Group Panel Estimator Ψ_{MG} . The model is hence running separate regressions to further on obtain the average of these coefficient values (Pesaran and Smith, 1995). Formally, the MG estimator is given by

$$\Psi_{MG} = \frac{1}{N} \sum_{i=1}^N \Psi_i.$$

Using the mean group estimator, the baseline regression model accordingly takes its form in the following way:

$$\begin{aligned} Growth = & \beta_0 + \beta_1 YearsinEU + \beta_2 (YearsinEU)^2 + \beta_3 ShareofInvestment \\ & + \beta_4 HumanCapital + \beta_5 PopGrowth + \beta_6 GapRatio + \varepsilon_{it} \end{aligned}$$

By including the squared *Years in EU*, the long-run effect of the EU-membership can be analysed and interpreted. This will provide a better estimation of the significance of integrating into the union over time, rather than just formally joining an RIA. The potential benefits of integration are results of domestic firms' incorporation in the single market, deepened trade activities, the share of technological knowledge and human capital as well as other cross-borders collaborations greatly facilitated by the EU (Conti, 2014). All of these occur over time and should gradually become more intensified. This being the reason for which the squared independent variable is expected to have a positive coefficient, as well as justifies its relevance in the model set-up. The advantage of using the MG-estimator is motivated by the fact that it allows the coefficients to be different for each country, before taking the average of all the coefficients. This as it is realistically probable that different countries react differently to the independent variables, rather than identically.

4.3.2 Robustness Tests

To test the robustness of results, multicollinearity was checked for by examining the correlations of variables. No evidence suggesting multicollinearity was found, correlation tables for each sample are attached in the appendix (*see Table 4, Appendix*). Some outliers were identified by plotting (*see Table 5, Appendix*). These were thereafter eliminated. However, when re-running the regressions, this implied no substantial changes in the results. Regarding

non-stationarity of the independent variable, the trend is deterministic, and it must be trending upwards due to it being the number of years in EU which is an ever-increasing value (*see Table 6, Appendix*). This is hence not considered a problem in this case.

4.4 Split Sample

To check for robustness and variations in the data, the sample is split, and separate regressions are being run. Due to the expected differences in the effect of EU-integration between countries and regions, the sample was firstly divided into Western and Eastern European countries. This division is based on the Iron Curtain separation of the Cold War, and for the Eastern European data set all countries who used to belong to the Warsaw Pact plus former Yugoslavian nations (Slovenia and Croatia) are included. In the Western European data set, the Cold War-era NATO members, as well as the military neutral countries, are included. These historical reasons imply there have been and still are significant disparities in the socio-economic status of these parts of the EU. Due to the financial redistribution, the EU-Cohesion Fund and the theory of economic convergence, which states that poorer countries tend to grow faster than rich ones (Barro and Sala-i-Martin, 1992), the EU-integration independent variable is expected to show stronger effect for Eastern European countries.

Further on, the European Debt Crisis starting in 2009 resulted in yet more disparities as many Southern European countries were economically hit very hard. Due to this another split sample was created, simply separating the richest and poorest halves according to their GDP per capita in 2014 (last year of data timespan). Simply the GDP per capita values from the latest year are used, as the division of richest and poorest halves have not changed substantially during past decades and would thus not affect results. With the same reasoning, similar outcomes are expected to show here, as the 14 countries with the lowest GDP per capita should both benefit more from the EU Cohesion Policy, as well as have larger growth rate due to the convergence theory. A detailed list of the data samples, as well as descriptive statistics, are found in the appendix (*See Tables 1,2 & 3, Appendix*).

5. Results

5.1 Estimation Results

5.1.1 Full Sample Results

As previously stated, the effect of the number of years in the EU on member states' economic growth is examined by a mean group estimator regression analysis, where expectedly the independent variable would show a positive effect. Surprisingly, the regression results instead display a slightly negative coefficient value with a two-star significance level ($p\text{-value} < 0.05$). Control variables have expected coefficient values as the share of investment in GDP is strongly affecting the dependent growth variable with a high three-star significance level ($p\text{-value} < 0.01$). Population growth is also significant and shows an expected negative relationship with economic growth. Human capital and gap ratio both shows expected coefficient values, positive respectively negative, but are however not significant. The squared independent variable is nonetheless the one of interest as it, in contrary to its linear counterpart, shows a positive effect on economic growth while still having a two-star significance level.

Table 1: All Countries

VARIABLES	Coefficient Values
YearsinEU	-0.0128** (0.00536)
YearsinEU2	0.000973** (0.000391)
Share of Invest.	0.591*** (0.174)
HC	0.119 (0.0919)
PopGrowth	-1.046* (0.602)
GapRatio	-0.148 (0.111)
Constant	-0.362 (0.260)
Observations	1,451
Number of country_id	28

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

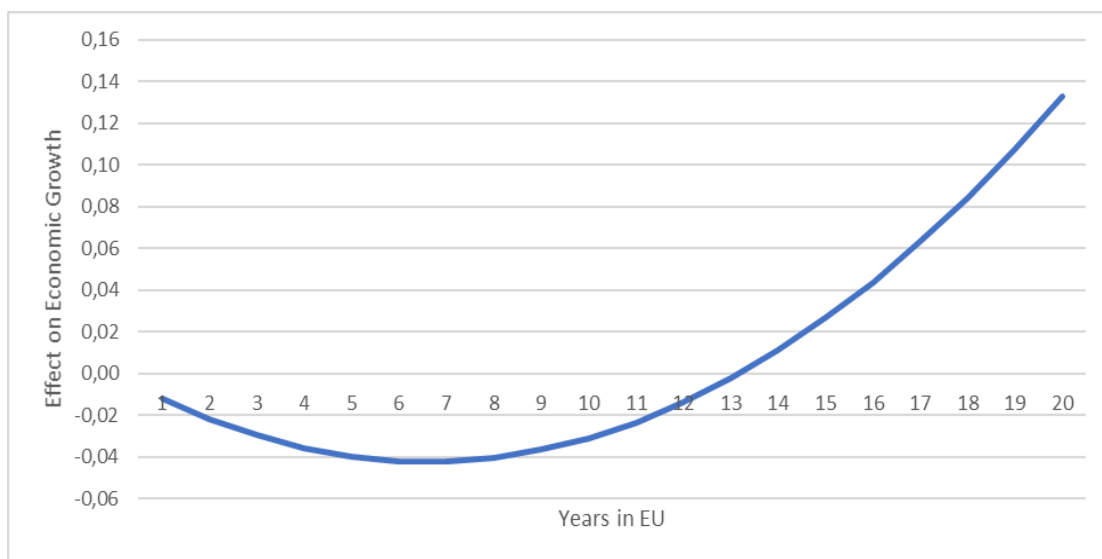
By graphing the following exponential function using the coefficient values, a visualisation can show the average amount of years into the EU membership until positive growth effects can be observed due to beneficial integration.

$$y = ax^2 + bx + c$$

$$\text{where } a = 0.000973, b = -0.1283, c = 0$$

In the figure below the exponential graph shows a breaking point in the thirteenth year as it then becomes positive and further on continues to increase. Before the thirteenth year, a slightly negative effect can be observed, which however starts increasing again during the eighth year. This suggests, all else equal, that positive growth effects from becoming an EU-member are seen in the medium to long-run, namely on average thirteen years into the membership.

Figure 1: Projected Economic Growth Effects - Full Data Set



5.1.2 Western and Eastern European Data Samples

Further regressions were then run to check for disparities within the union and test the hypothesis that poorer regions benefit to a larger extent, due to the theory of convergence as well as ambitions from the EU to financially support the less developed regions through redistribution of wealth. The first additional regressions were run on the split samples dividing Western and Eastern European countries. For the Western European sample, similar values can be observed, but the estimated coefficients proved not to be significant. However, for the

Eastern European sample, the positive impact from the squared independent variable shows to be even stronger, and with a three-star significance level. Control variables provide expected coefficient values, although only share of investment in GDP turns out significant. This thus suggests that Eastern European countries benefit to a larger extent from integrating into the EU, in terms of impact on domestic economic growth.

Table 2: Eastern European Sample

VARIABLES	Coefficient Values
YearsinEU	-0.0269** (0.0105)
YearsinEU2	0.00231*** (0.000847)
Share of Invest.	0.576** (0.230)
HC	0.157 (0.100)
PopGrowth	-1.932 (1.312)
GapRatio	-0.211 (0.259)
Constant	-0.484* (0.287)
Observations	354
Number of country_id	11

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 3: Western European Sample

VARIABLES	Coefficient Values
YearsinEU	-0.00372 (0.00467)
YearsinEU2	9.36e-05 (0.000126)
Share of Invest.	0.627** (0.247)
Human Capital	0.1000 (0.139)
PopGrowth	-0.418 (0.515)
GapRatio	-0.127 (0.0833)
Constant	-0.293 (0.391)
Observations	1,097
Number of country_id	17

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

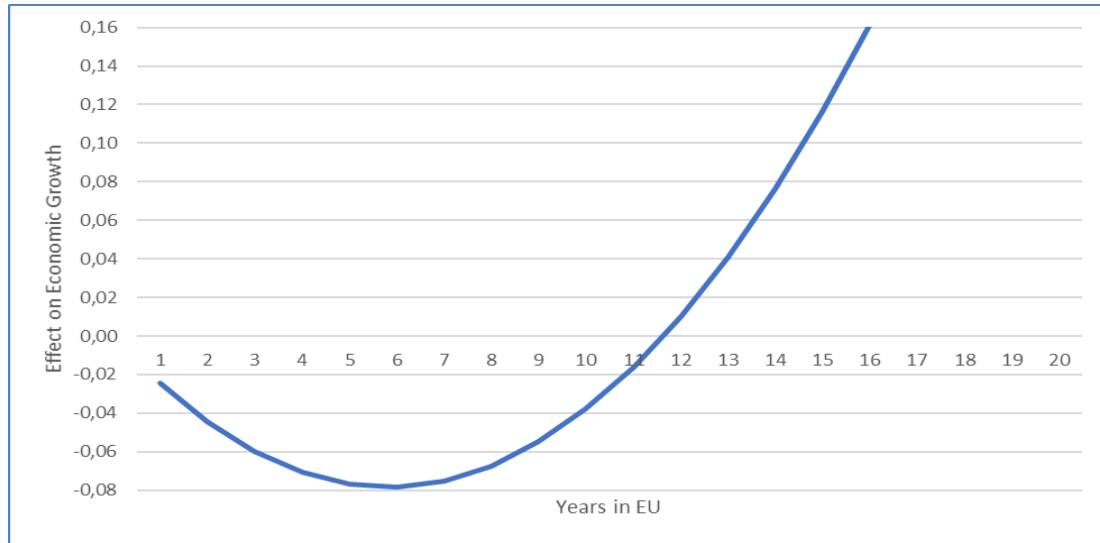
Applying the same concept, the exponential function is visualised in order to see the medium to long-run effects of the EU-membership.

$$y = ax^2 + bx + c$$

$$\text{where } a = 0.00231, b = -0.0269, c = 0$$

Figure 2 shows a similar trend to the previous one. However, the negative effect on economic growth in the beginning is stronger and the graph steeper. The turning point is although sooner, as the negative effect starts increasing approximately between the sixth and seventh year and then becomes positive between the eleventh and twelfth year of membership. The benefits from the membership hence tend both to be visible earlier and further on becoming stronger than in the case when the full data set is used. This evidence thus suggests that Eastern European countries firstly encounter some economic drawbacks from joining the EU. The trend then shifts after about six years, and substantial positive growth effects can be observed twelve years into the membership, all else equal.

Figure 2: Projected Economic Growth Effects – Eastern European Data Sample



5.1.2 Richest and Poorest Halves Data Samples

To further test the theory of less developed regions benefiting economically more from integrating into the EU, another split sample was done where simply the fourteen countries with highest and lowest GDP per capita in 2014 were placed in separate samples. The Eastern bloc is still dominating the poorest half, although some southern European countries are now also included. The regression analysis confirms the previous results and demonstrates a similar trend. For the richest fourteen countries, no proven effect can be concluded as estimated coefficients are insignificant. Correspondingly to the previous results, positive effects for the squared independent variable are observed for the poorest fourteen countries also implying positive effects in the medium to long-run time prospect. The estimated coefficients are significant with a three-star level, and controls are displaying expected values, though also here only share of investment in GDP is significant. Again, the results suggest that the less developed regions of the EU see positive growth effects over time, while no conclusion on significant growth impact can be made regarding wealthier EU member states.

Table 4: Poorest Half Sample

VARIABLES	(1) Model3
YearsinEU	-0.0224*** (0.00867)
YearsinEU2	0.00193*** (0.000697)
Share of Invest.	0.531*** (0.180)
HC	0.119 (0.0812)
PopGrowth	-1.488 (1.047)
GapRatio	-0.182 (0.203)
Constant	-0.382* (0.231)
Observations	547
Number of country_id	14

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 5: Richest Half Sample

VARIABLES	Coefficient Values
YearsinEU	-0.00275 (0.00560)
YearsinEU2	-1.11e-05 (0.000104)
Share of Invest.	0.702** (0.299)
Human Capital	0.117 (0.170)
PopGrowth	-0.524 (0.625)
GapRatio	-0.121 (0.0994)
Constant	-0.351 (0.477)
Observations	904
Number of country_id	14

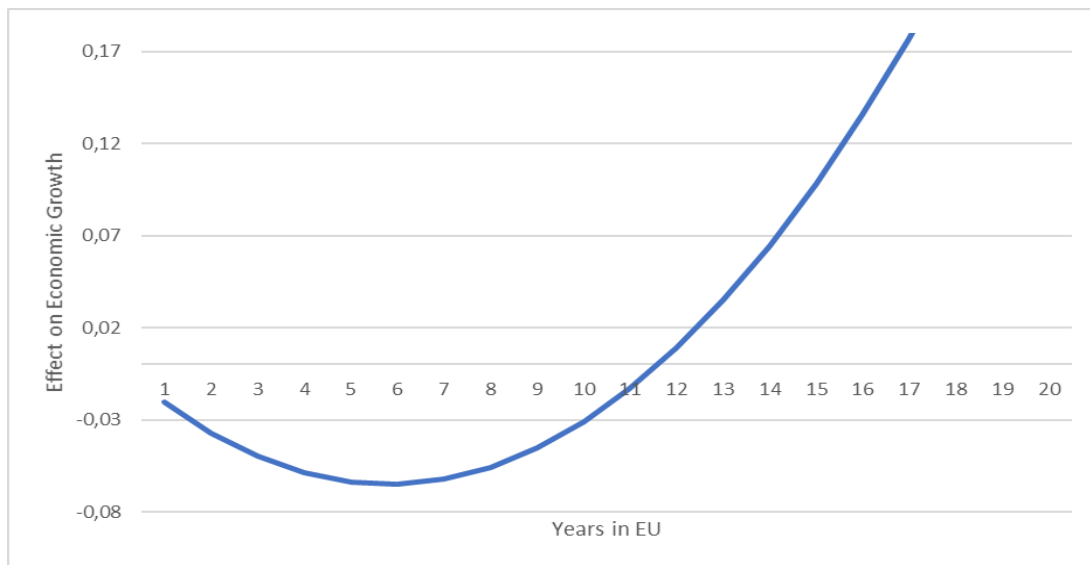
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The exponential graph on the growth effects for the poorest fourteen countries illustrates the same pattern as before (*Figure 3*). A negative effect is initially recorded but starts increasing after year six, to then be positive after year eleven. The results are thus principally the same as in *Figure 2*. As in previous figures when assuming all else equal, this is suggesting that the poorer countries of the EU firstly see some slightly negative effects on growth. Though, after about six years of membership, these effects instead start increasing and significantly positive effects on long-term growth can be observed after eleven years of membership.

$$y = ax^2 + bx + c$$

$$\text{where } a = 0.00193, b = -0.0224, c = 0$$

Figure 3: Projected Economic Growth Effects – Poorest Half Data Sample



5.2 Analysis

The purpose of this paper is to examine potential growth effects from joining and integrating into the European Union. The theoretical framework set the basis for a hypothesis, stating that the less developed regions will, over time, experience more positive effects of EU membership on economic growth than the wealthier regions. This with regards to both the theory of convergence (Barro and Sala-i-Martin, 1992) as well as to EU financial support and distribution-of-wealth strategies through the Cohesion Policy (Pieńkowski & Berkowitz, 2015).

The regression analysis did surprisingly not show a positive effect for the independent variable *Years in EU*, but rather a slightly negative effect instead. However, as presented above, the squared independent variable did turn out positive and significant, and the exponential graphs visually displayed the expected amount of years it would take for positive impact to take effect. This could be due to initial costs associated with certain adaptations and regulations when entering the union. There are many potential challenges facing a country, in particular a less developed such, when becoming a member of the EU, entering the common market as well as adapting to EU regulations and rules. These could include increased costs of living, foreign competition threatening domestic companies and a considerable outflow of human capital (Nikolova & Nikolaev, 2017).

In the longer-term, the results however suggest evidence of positive effects on economic growth, as the squared independent variable provided a significant and positive coefficient value (*see Table 1*). It seems hence that becoming a member is in fact initially associated with slightly negative effects on growth in the short-term, potentially due to certain costs, alterations and obligations arising with the membership. Over time these short-term negative effects will nonetheless mitigate and further on become positive, possibly as the integration process deepens and a country has had time to gain from open trade advantages, the common market, the spread of knowledge and foreign investment opportunities. These conclusions are in line with much of the previous literature, in particular Cuaresma et al. (2008), Mann (2015) and Campos et al. (2018).

Due to the heterogeneous effects of EU-membership, which much literature has pointed out, split-samples were constructed and separate regressions on these were run. According to the hypothesis, the less developed regions showed to be benefiting more from positive growth effects through the EU-membership, although only in the medium to long-run after about eleven years. In the short-term, the membership is in fact associated with slightly negative impact on the economic growth. When running separately, no significant effect could be found for wealthier EU countries, which was somehow unexpected. Even though less developed regions were expected to benefit more in terms of growth effects, it was still expected that the number of years in the EU would show some significant effect for the wealthier countries as well. These estimated coefficients thus provide no significant evidence that wealthier countries of the EU see positive effects on economic growth from the membership. However, other measurements which consider more factors of importance could show otherwise – which can also be observed in some of the previous studies. The results of this paper nevertheless suggest evidence of convergence between the wealthier and less-wealthier nations of the EU, in particular between

Western and Eastern European countries. Results are hence in line with the theory of economic convergence, as well as provide some evidence that the financial support from the EU to these regions through the Cohesion Policy is effective. Further examination on the Cohesion Fund's specific effect on welfare and economic growth would nonetheless be needed in order to support this idea further.

These trends in the data hence propose the interpretation that less-developed EU countries benefit significantly in the long-run from accessing the common market, a broader framework of technology, trade liberalization, the spread of human capital and even the effects of the EU Cohesion Policy and Structural Funds to some extent. Even though short-term costs related to the entrance can negatively affect economic growth, the long-term benefits will outdo this initial period of drawbacks. The results provide to some degree the evidence that joining the EU should be highly desirable for relatively deprived regions of Europe as the long-run benefits are considerable. The paper can nevertheless not provide any noteworthy evidence of Wealthier EU-states, being Western European countries or simply the fourteen richest countries, significantly benefiting from positive growth effects due to the membership. Although, as argued previously, other models and measurements of integration could show otherwise. This has been observed in other studies where evidence for overall positive growth effects from EU integration has been suggested (Henrekson et al., 1997; Cuaresma et al., 2008); Mann, 2015) & Campos et al., 2018). The results are nonetheless of interest in times of rising Euroscepticism, not at least for Eastern European countries and relatively poorer candidate countries. Much empirical work in recent times provide evidence of long-term benefits from European integration through the EU, and this paper contributes with indications of significant catching-up effects for weaker economies as well as a considerable long-run positive impact on economic growth for less-developed countries as a result of the EU-membership.

In terms of causality, the results hence suggest that increased economic growth can be observed from the EU membership in the medium- to long-run. The findings have support in much of the empirical literature as well as in the theoretical framework. It should however also be discussed that it is potentially the case that exclusively countries who have fulfilled some criteria and already gained some economic progress are the ones who eventually gain membership. This could hence imply that the results suggesting EU-membership is positively affecting economic growth is, in fact, a result of already prior economic progress leading to the EU-membership. As a set of conditions in the shape of the 'Copenhagen Criteria' (European Commission, 2019) do need to be fulfilled before joining the EU, which to a large extent are with regards to certain economic progress, this is a valid point to make. However, the empirical

association, theoretical backing and the set of control variables showing predicted signs support the suggested evidence. Additionally, the results, showing no short-term positive effects from the EU-membership, legitimizes the interpretation and analysis made. The fact that the results suggest it takes some years of integrating after gaining membership to experience the benefits does not support the previous reasoning. This evidence instead implies that this theory, saying that the positive relationship is a result of only already progressed countries joining the EU, does not hold, as it is here suggested that it takes some years into the membership for a new member-state to see the positive growth effects.

6. Conclusion

This paper has examined the effects of EU membership on economic growth over time by applying regression analysis using a mean group estimator model. A data set of the 28 EU member states, stretching over a time span of 1950-2014, was used to test the effect of the number of years in EU on countries' economic growth. The independent variable was constructed from the number of years as a member of the EU, which was also squared to check for medium to long-run effects on growth. The data set was also split in a set of samples to test for variations due to expected heterogeneous effects. Economic disparities between countries within the EU implied that results were projected to show stronger growth effects from membership in less-developed countries due to both EU cohesion policies as well as the theory of convergence.

The results were significant and indicated that years in EU, in fact, had a slightly negative effect on growth, while the squared independent variable instead showed positive effects on growth. Visualisation of these results illustrated a slight initial negative effect, which became positive after thirteen years of membership to further increase substantially. The interpretation made was such that certain initial costs related to adaption and regulations could actually cause this slight negative effect which is however outdone by the long-term gains of which the membership has on economic growth. The split sample regressions showed surprisingly no significant effects for wealthier countries, and no conclusion could be made of these. However, for Eastern European countries and the countries with relatively lower GDP per capita, there were substantial long-run positive effects on growth to be found. Also here there was an initial negative effect which turned out even stronger than before. This effect could, however, both be observed to turn around and increase earlier and further on become positively stronger. This confirmed the hypothesis that the less-developed countries benefit more from EU membership due to the convergence theory as well as effects from integrating and benefiting from EU Cohesion Policies. This paper can thus not provide any significant result of positive growth effects on wealthier EU countries. However, the results suggest evidence that less-developed countries will benefit largely from EU membership in the long run even though there are initial and short-term drawbacks.

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Appendix

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	1,820	1982	18.76682	1950	2014
YearofEntrance	1,820	1988.286	19.07627	1958	2013
Population	1,465	18.78289	22.17241	.2960219	82.01018
Human Capital	1,465	2.685872	.5081654	1.241877	3.734285
Share of Invest.	1,465	.2725635	.1186804	.0514991	2.743856
GapRatio	1,465	.6127348	.2349915	.133435	1
GDP per Capita	1,465	20343.38	10978.56	1988.303	58197.78
YearsinEU	1,820	8.081868	13.92631	0	56
YearsinEU2	1,820	259.1522	602.4594	0	3136
GDPpc_L1	1,464	20332.32	10974.14	1988.303	58197.78
Pop_L1	1,464	18.75178	22.14798	.2960219	82.01019
PopGrowth	1,451	.1240866	2.375035	-39.24026	42.30832
growth	1,451	.012343	.1529007	-2.130492	.1858274

Table 2: Split Sample 1

Western European Sample	Eastern European Sample
Austria	Bulgaria
Belgium	Czech Republic
Cyprus	Estonia
Germany	Croatia
Denmark	Hungary
Spain	Lithuania
Finland	Latvia
France	Poland
United Kingdom	Romania
Greece	Slovakia
Ireland	Slovenia
Italy	
Luxembourg	
Malta	
Netherlands	
Portugal	
Sweden	

Table 3: Split Sample 2

Countries with highest GDP per Capita - Sample	Countries with lowest GDP per Capita - Sample
Austria	Bulgaria
Belgium	Cyprus
Germany	Czech Republic
Denmark	Estonia
Spain	Greece
Finland	Croatia
France	Hungary
United Kingdom	Lithuania
Ireland	Latvia
Italy	Poland
Luxembourg	Portugal
Malta	Romania
Netherlands	Slovakia
Sweden	Slovenia

(CIA World Factbook, 2019, with data from 2014)
(Countries are not in order according to size of GDP per Capita)

Table 4: Multicollinearity Tests

Full Sample

	growth	YearsinEU	YearsinEU2	csh_i	hc	PopGrowth	GapRatio
growth	1.0000						
YearsinEU	0.0151	1.0000					
YearsinEU2	0.0015	0.9488	1.0000				
csh_i	0.0501	-0.0521	-0.0413	1.0000			
hc	0.0653	0.4083	0.3639	-0.2381	1.0000		
PopGrowth	-0.2782	-0.0060	-0.0040	-0.0177	-0.0225	1.0000	
GapRatio	-0.0110	0.4406	0.3558	0.0282	0.1541	0.0138	1.0000

Eastern European Sample

	growth	YearsinEU	YearsinEU2	csh_i	hc	PopGrowth	GapRatio
growth	1.0000						
YearsinEU	-0.0354	1.0000					
YearsinEU2	-0.0273	0.9633	1.0000				
csh_i	0.1755	0.2128	0.1368	1.0000			
hc	-0.0408	0.5098	0.4437	0.3886	1.0000		
PopGrowth	0.0760	-0.1429	-0.1093	0.0500	-0.4606	1.0000	
GapRatio	-0.0656	0.3634	0.3429	0.6020	0.4703	0.0851	1.0000

Western European Sample

	growth	YearsinEU	YearsinEU2	cs _h _i	hc	PopGrowth	GapRatio
growth	1.0000						
YearsinEU	0.0375	1.0000					
YearsinEU2	0.0186	0.9483	1.0000				
cs _h _i	0.0504	-0.1822	-0.1396	1.0000			
hc	0.0782	0.5998	0.5272	-0.2313	1.0000		
PopGrowth	-0.1279	-0.0030	-0.0025	-0.0292	0.0211	1.0000	
GapRatio	0.0397	0.3111	0.2475	-0.2977	0.5091	-0.0293	1.0000

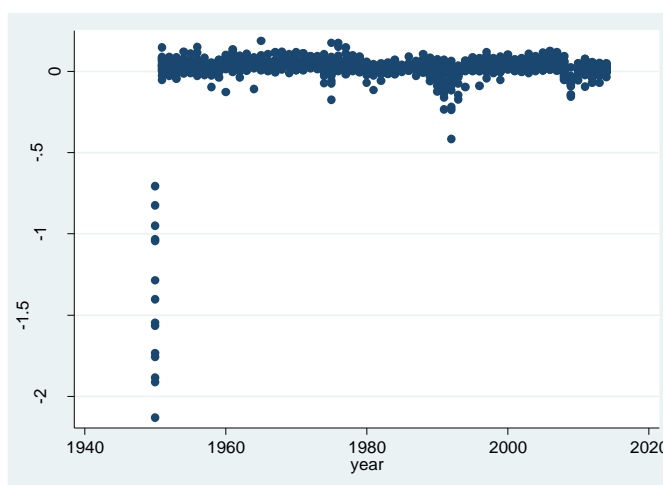
Poor Half Sample

	growth	YearsinEU	YearsinEU2	cs _h _i	hc	PopGrowth	GapRatio
growth	1.0000						
YearsinEU	-0.0405	1.0000					
YearsinEU2	-0.0444	0.9310	1.0000				
cs _h _i	0.0409	-0.0207	-0.0366	1.0000			
hc	0.0628	0.1386	0.0495	-0.2971	1.0000		
PopGrowth	0.7014	0.0181	0.0114	0.0262	0.0918	1.0000	
GapRatio	0.0362	0.3332	0.2425	0.3107	-0.0766	0.0507	1.0000

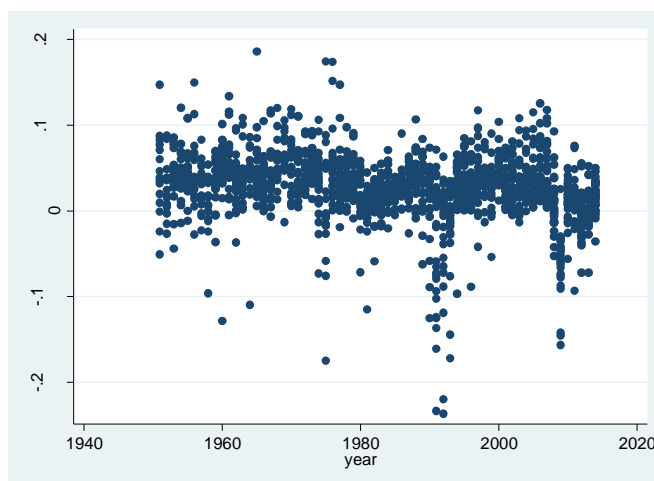
Rich Half Sample

	growth	YearsinEU	YearsinEU2	cs _h _i	hc	PopGrowth	GapRatio
growth	1.0000						
YearsinEU	0.0515	1.0000					
YearsinEU2	0.0269	0.9511	1.0000				
cs _h _i	0.0623	-0.1282	-0.0999	1.0000			
hc	0.0838	0.5818	0.5201	-0.2062	1.0000		
PopGrowth	0.0122	0.0104	0.0070	0.0020	0.0250	1.0000	
GapRatio	0.0243	0.2367	0.1696	-0.2363	0.3288	-0.0417	1.0000

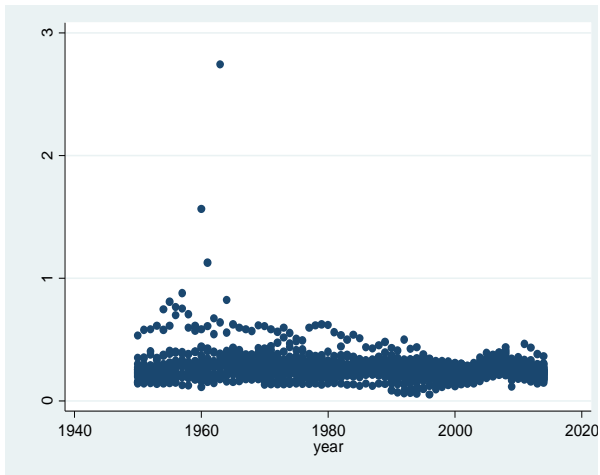
Table 5: Plotting Outliers



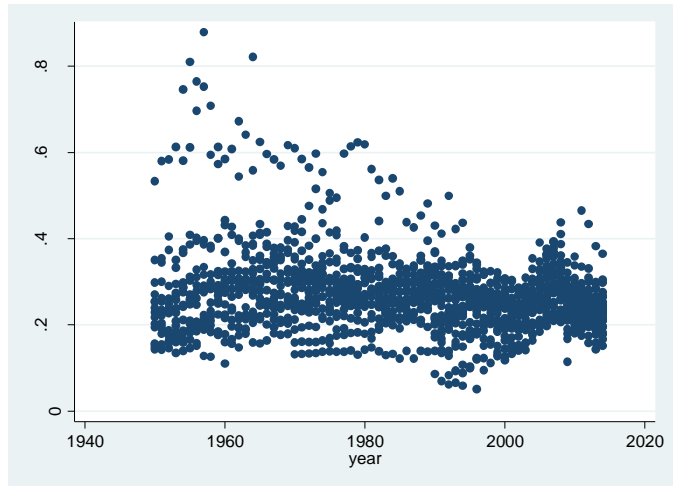
Growth rate outliers in year 1950



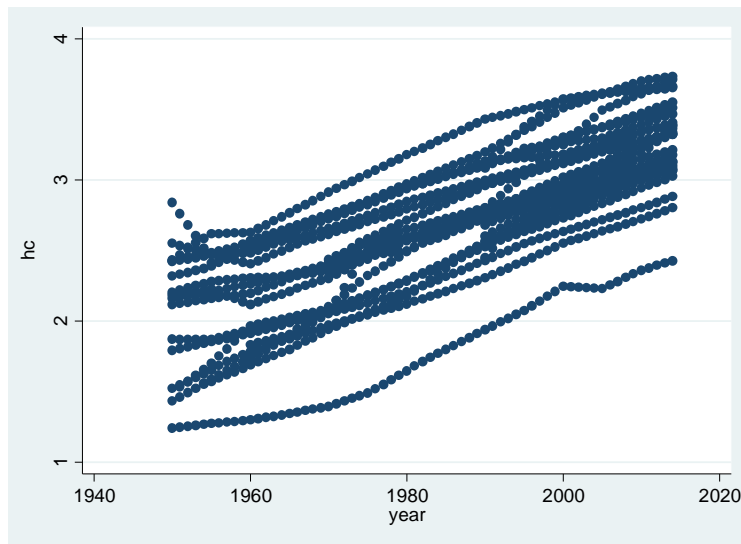
Growth Rate with outliers set as missing



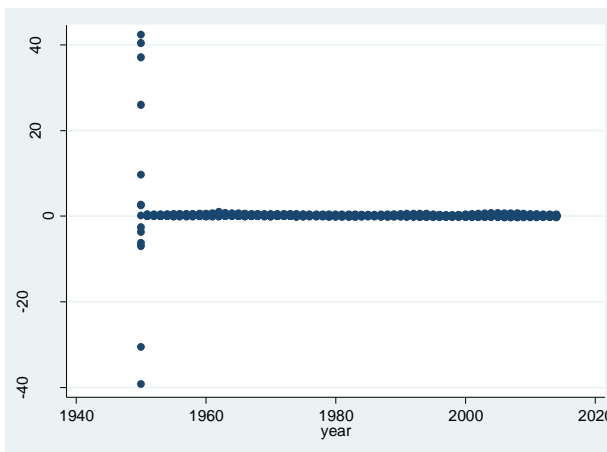
Share of investment with outliers



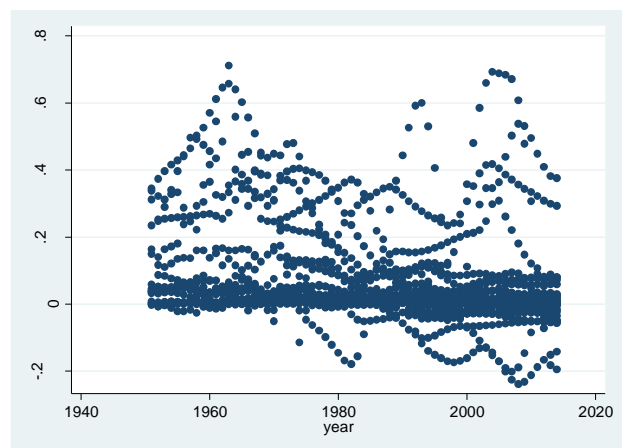
Share of investment with outliers set as missing



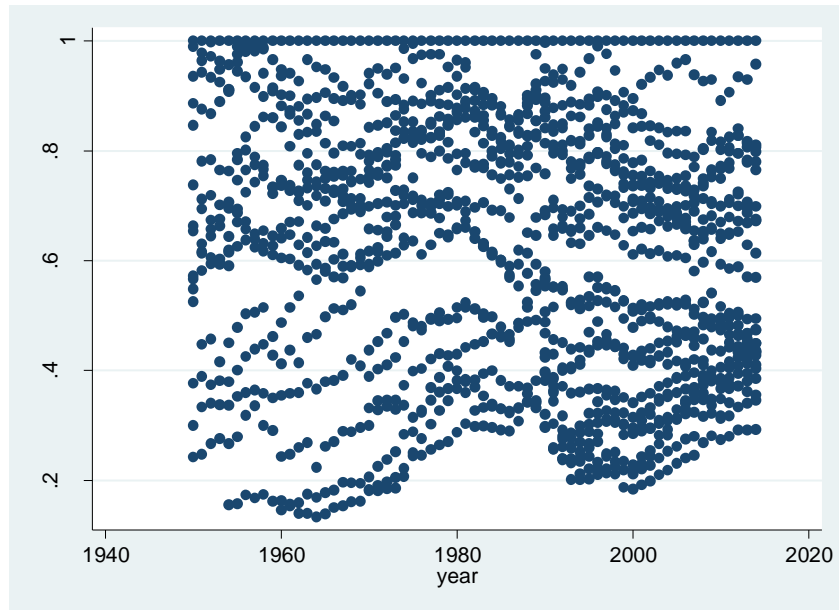
Human Capital distribution – no removed outliers



Population growth with outliers in year 1950

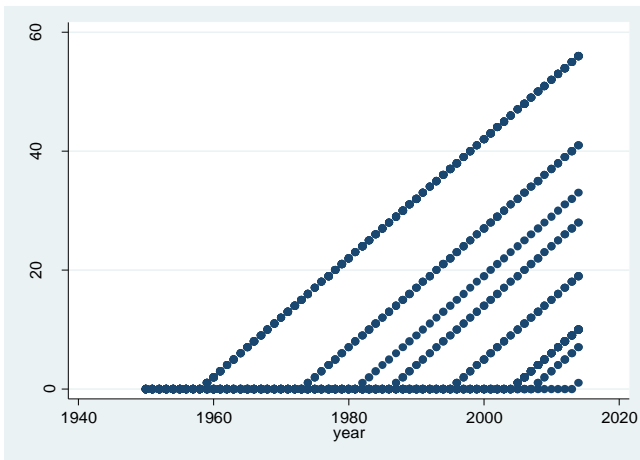


Population growth with outliers set as missing (year 1950)

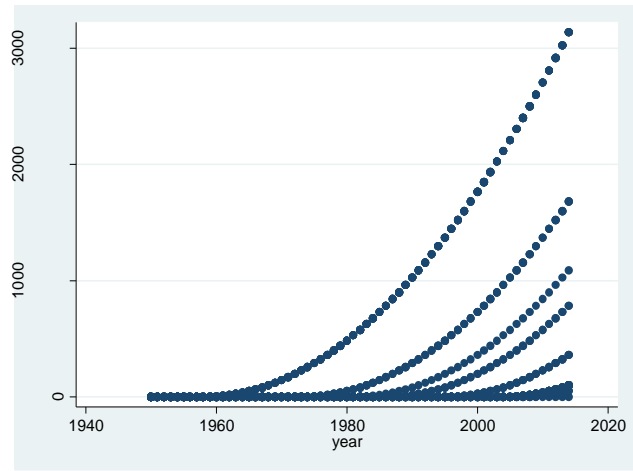


Gap Ratio distribution – no removed outliers

Table 6: Deterministic Trend of Independent Variable



Years in EU



$(\text{Years in EU})^2$