Growth Effects of European Integration: Implications for EU Enlargement

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1 Introduction

For the last 50 years there has been widespread discussion about the economic consequences of European integration. The basic questions are: Is economic integration growth enhancing? Are the rich getting richer and the poor getting poorer, or will the income levels of the EC/EU member countries converge as a consequence of integration? Furthermore, which countries will profit most from intensified trade among the members?

The theoretical literature on economic growth has gone through several phases, and the answers to the above questions depend on the specification of the respective growth model.

From the late 1950s to the mid-1980s the simple Solow-Swan "exogenous growth model" dominated the literature (Solow, 1956). According to the neoclassical theory, the economy converges towards a steady state due to diminishing returns to investment in physical capital. Assuming a constant population, the long-run growth rate is solely determined by the rate of technological change, which is assumed to be exogenous. As the growth rate is therefore independent of any economic behavior, economic policy changes will only have a temporary effect on economic activity.

The same is true for economic integration. Technological change is considered a public good common to all countries, so that they all share the same long-run growth rate determined by technological progress only. Therefore the integrated economy will expand along this unchanged steady state growth path in the long run, and the reallocation of resources will only temporarily have an influence on the growth rate. Hence according to the neoclassical view of growth, European integration should not have a lasting effect on growth rates. However, the income levels should converge perfectly.

In the mid-1980s the so-called "endogenous growth theory" revolutionized the literature on economic growth (Romer, 1990). Technology that was formerly considered a public good and exogenous now became endogenous and subject to decision-making processes at individual firms. According to this concept, enterprises have an incentive to invest in research, as the development of new technologies assures them of the possession of temporary monopoly power. But the absorption of monopoly rents is limited, as knowledge is only partially excludable. Patent protection is limited in time, and inventions can be used as input to further research and new technological innovations. These knowledge spillovers prevent the firms from collecting the full monopoly rent for their new inventions.

The aspect of the new growth theory according to which technological progress depends on the research activities of individual firms which seek to collect monopoly rents opens a new view on the issue of economic growth in an integrated region: now an increased scale of the economy will have a lasting

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positive effect on growth. On the one hand, knowledge spillovers imply increasing returns to scale to capital accumulation. On the other hand, the monopoly rent increases with the number of consumers while the costs for research and development are independent of the size of the economy. The prospect of higher profits increases the incentive for further research and hence spurs economic growth. These two factors together imply that the long-run growth rate increases with the size of the economy.[1])

To sum it up, the consequences of European integration are fundamentally different within the framework of endogenous growth. The more countries join the European Union and hence the larger the scale of the integrated economy is, the higher the incentive for research and development is and, accordingly, the higher the growth rate is. Enhanced growth is now not only a transitory, but a permanent phenomenon from which all countries profit in the long run.

Most empirical papers on economic growth aim at detecting the main determinants of long-run growth without referring explicitly to regional integration (for European regions see, for example, Sala-i-Martin, 1996). The first papers dealing with the question of a possible growth bonus associated with European integration were all cross-country studies. Basically, they compare EU members with other countries that have not joined the European Union, mostly countries at a similar stage of development. The basic question is whether there exists a global growth benefit from being a EU member. Most of the studies do not find any such growth bonus (see for example De Melo et al., 1992 or Landau, 1995).

However, panel data regression techniques opened up a new way to deal with the question of possible growth benefits associated with EU membership. This makes it possible to focus exclusively on the current EU Member States. The basic question then can be whether in retrospect the current EU members profited from regional integration.

There are two studies which ask questions similar to the ones discussed in our paper, although they look at a wider set of countries and do not exclusively focus on EU members.

Vanhoudt (1999) tests the validity of the neoclassical implication that regional integration has no impact on long-term growth against the alternative model based on endogenous growth theory. He carries out panel data regressions on 23 OECD countries to check whether EU membership had a positive impact on growth compared to developed countries which have not joined the European Union. He does not find evidence of a significant long-run growth bonus associated either with EU membership or with membership length. Also, the results do not support the hypothesis of a scale effect on growth. The author concludes that the neoclassical hypothesis cannot be rejected by the data.

Henrekson et al. (1997), who focus on EC as well as on EFTA member countries, find the opposite result: EC/EFTA membership may increase growth rates significantly, by around 0.6 to 0.8 percentage point per year. However,

1 *A countervailing effect of integration which could work in the direction opposite to the one described in the text refers to the fact that, in a larger market, competition is more intense and monopoly rents are smaller and more short-lived. However, empirical research on the effect of trade integration on growth suggests a dominant role of the growth-enhancing effect. See below for some references.*

apparently it does not matter whether a country is an EC or an EFTA member. Their results support the hypothesis that regional integration in Europe can have significant growth effects and suggest that further regional integration may be growth enhancing in the long run. However, the results of the paper are not completely robust with respect to changes in the model specification.

Both these studies and the present paper deal with the question of whether European integration had a positive impact on long-term growth in the member countries. Our study, however, deviates from the other two in that it exclusively focuses on the current EU Member States[1]) and in that it deals with the issue of convergence within the integrated European economy. Our questions are: Have per capita income levels in European countries converged towards each other since the 1960s? And if EU membership had a favorable impact on growth in these countries, can we detect subsets of countries that profited more than average from EU membership? Can we conclude from these asymmetric gains in growth that convergence was also a consequence of intensified economic involvement due to European integration?

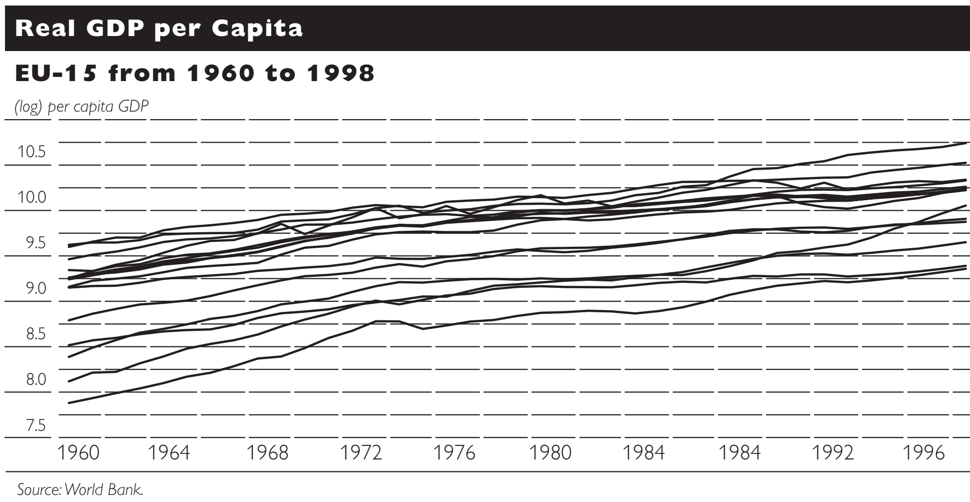
2 Convergence and Growth in the EU – Concepts and First Results

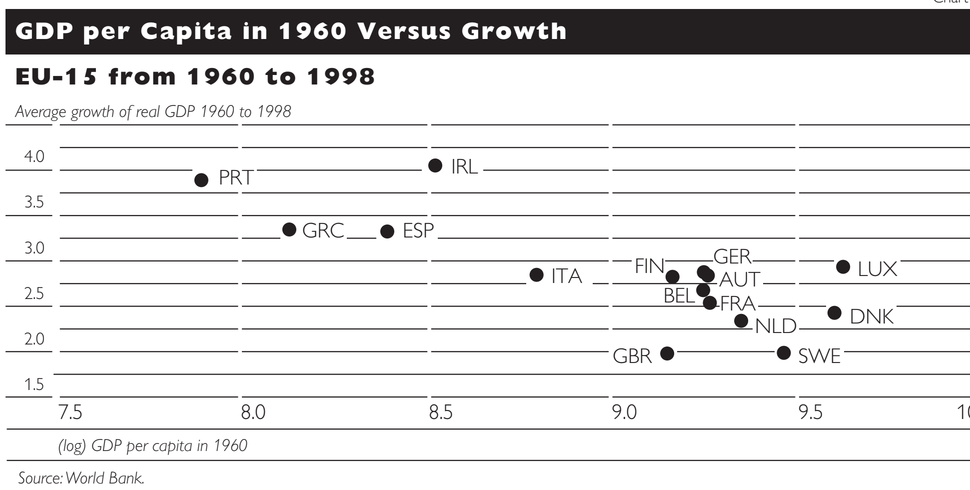
The term *β-convergence* was coined by Barro and Sala-i-Martin (1992) and refers to the negative correlation between initial levels of real GDP per capita and its average yearly growth rate either after conditioning for certain control variables *(conditional β-convergence)* or without conditioning *(unconditional β-convergence)*. For a complete survey on the empirical literature dealing with evidence on β-convergence, see, e.g., Durlauf and Quah (1998).[2]) Together with the concept of β-convergence, Barro and Sala-i-Martin (1992) introduce the complementary concept of *σ-convergence,* which refers to the decrease of the dispersion of real GDP per capita across economic units through time. It should be noted that β-convergence is a necessary but not sufficient condition for σ-convergence.

Chart 1 shows the evolution of real GDP per capita between 1960 and 1998 in the 15 current EU Member States to provide a first visual approach to the study of convergence in the EU. Evidence of β-convergence is difficult to extract from the graph, but becomes clearer when we use a scatter plot relating initial levels of real GDP per capita to average growth. Chart 2 shows a scatter plot aimed at checking for (unconditional) β-convergence in the European Union for the period 1960–98: on the x axis, the (log) level of real GDP per capita is represented, while the y axis shows the average yearly growth of real GDP per capita in the period 1960–98. A visual inspection shows a negative relationship between both variables.

1 *Another recent contribution to this branch of literature, Badinger (2001), focuses exclusively on European countries using a somehow different approach and again finding no evidence for a growth bonus of EU membership.*

2 *Notice that this approach is not free from criticism. For a critical view and alternative concepts of convergence based on the time series properties of real GDP per capita, see for example Bernard and Durlauf (1996).*





This first indication of convergence is confirmed by dividing the data into four subperiods (1961–70, 1971–80, 1981–90, 1991–98)[1]) and estimating the β parameter in the panel regression

$$[ln(y_{Tt,i}) - ln(y_{0t,i})]/n_t = \alpha + \beta ln(y_{0t,i}) + u_{t,i}, \qquad (1)$$

where $y_{Tt,i}$

where $y_{Tt,i}$ refers to the real GDP per capita in the last year of period t (t = 1,2,3,4 stands for each of the subperiods described above) for country i, $y_{0t,i}$ refers to the value of real GDP per capita in the initial year of period t and

1 *A minimum amount of eight years seems reasonable for studying long-term growth features, because thus business cycle fluctuations are eliminated.*

n_t is the number of years in period t. Equation (1) has been estimated based on different assumptions for the error term, and the results are presented in table 1.[1])

Table 1

Unconditional β-Convergence in the EU

	Common Intercept	Fixed Effects (one way)	Fixed Effects (two way)
β	−1.91*** (0.20)	−3.02*** (0.37)	−4.88*** (1.41)
Observations	56	56	56
R^2_{adj}	51.3%	62.3%	62.4%

Source: OeNB.
*Note: ***(**)[*] stands for 1% (5%) [10%] significant.*

The first column shows the result for the assumption that the error term is independent of the cross-sectional units (countries) and iid normal (that is, the panel is estimated as if it were a cross-country regression). The second column shows the results for the assumption of fixed country effects, that is,

$$u_{t,i} = \mu_i + \epsilon_t, \tag{2}$$

where μ_i is a country-specific constant and ϵ_t is white noise. Finally, the third column shows the estimated β under the assumption of fixed country and time effects, that is,

$$u_{t,i} = \mu_i + \lambda_t + \epsilon_t, \tag{3}$$

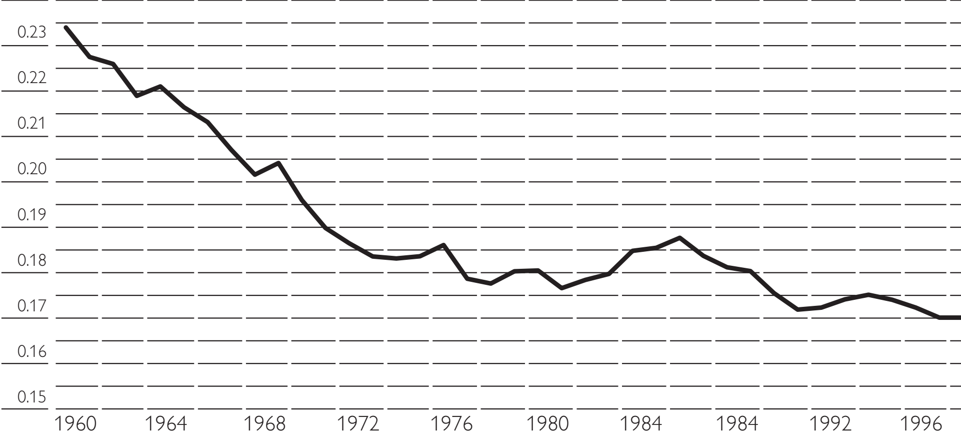
where μ_i and ϵ_t are defined as above, and λ_t is an exclusively time-dependent constant effect.

Chart 3

Real GDP per Capita Dispersion

EU-15 1960 to 1998

Standard deviation of per capita income



Source: World Bank.

1 *Throughout the study, Luxembourg was excluded from the estimations for two reasons: It is typically considered an outlier, and no data on average education years are available for this country in Barro and Lee (2001).*

All specifications reported in table 1 point toward the existence of very significant unconditional β-convergence across the current EU members for the period 1960–98.

Chart 3 shows the evolution of the cross-country coefficient of variation of per capita GDP for the period 1960–98. By visual inspection the trend is clearly decreasing, indicating σ-convergence. Whether the standard deviation in the final period is significantly different from that of the first period can be investigated using the test developed by Carree and Klomp (1997). The result indicates σ-convergence.

3 Growth and EU Membership

3.1 The Basic Model and Some Extensions

In order to study explicitly the determinants of long-term growth in Europe in the last four decades, equation (1) will be extended by including an augmented set of explanatory variables. The obvious candidates to form part of the group are those variables which are explicitly implied by economic theory and which have been used in virtually every empirical study on economic growth: the initial (log) level of per capita GDP (evaluated in our case at the first year of each subperiod), the investment rate (subperiod average) and some proxy for human capital (average years of education of population over 25, evaluated in the first year of the subperiod).[1])

Together with these basic variables others which are considered to be relevant to economic growth have been included in the econometric specification. The specification in which all the estimated models presented in table 2 are nested is:

$$[ln(y_{Tt,i}) - ln(y_{0t,i})]/n_t = \beta_1 ln(y_{0t,i}) + \beta_2 INV_{t,i} + \beta_3 ED_{t,i} + \beta_4 INF_{t,1} + \beta_5 GOV_{t,i} + \beta_6 OP_{t,i} + \beta_7 YEA_{t,i} + u_{t,i}, \quad (4)$$

where $ln(y_{0t,i})$ is the (log) initial GDP per capita of country i in subperiod t, $INV_{t,i}$ is the investment rate, $ED_{t,i}$ refers to the years of education, $INF_{t,i}$ is the subperiod-average inflation rate, $GOV_{t,i}$ is government consumption over GDP, $OP_{t,i}$ is openness of the economy defined as trade over GDP, and $YEA_{t,i}$ is the average length of EU membership (in years) for country i in subperiod t.[2]) The error term $u_{t,i}$ is assumed to be composed by a constant country-specific effect and a common constant time effect, although in the estimation the latter will only be included if found significant.

1 *Empirical studies dealing with a more heterogeneous set of countries tend to include population growth as an explanatory variable. In our case, the variable appeared insignificant in every specification in which it was included and was therefore not added to the set of explanatory variables. The same occurred when a sociodemographic variable like female participation in the labor market was used. A possible explanation of the lack of significance of labor participation would be the high correlation between this variable and initial GDP.*

2 *For Germany we use data for West Germany until 1991, and for the unified Germany from 1991 onwards. Initially, an additional dummy variable was included in order to account for the German unification, but it appeared insignificant in all specifications.*

Table 2

Growth Panel Data Regressions

Model	1	2	3	4
Initial GDP	−5.60*** (1.44)	−3.80*** (0.53)	−4.73*** (0.73)	−4.74*** (0.76)
Investment Rate	0.13** (0.05)	0.13*** (0.04)	0.17*** (0.04)	0.18*** (0.04)
Years of Education	0.12 (0.10)	0.22 (0.16)	0.34** (0.16)	0.35** (0.16)
Inflation Rate		−0.12*** (0.02)	−0.11*** (0.02)	−0.11** (0.03)
Government Consumption		−0.06 (0.08)	−0.01 (0.10)	–
Openness		0.06** (0.03)	0.06** (0.03)	0.06** (0.03)
Years in the EU			0.04* (0.02)	0.04** (0.01)
Observations	56	56	56	56
R^2_{adj}	63.8%	76.3%	77.1%	77.7%

Source: OeNB.
*Note: All EU countries except Luxembourg included (data for West Germany until 1991, unified Germany afterwards), with data ranging from 1960 to 1998, divided into four periods: 1960-1970,1971-1980, 1981-1990 and 1991-1998. White heteroskedasticity/serial correlation-corrected standard errors in parenthesis. Fixed effects estimation with period-specific time dummies included if jointly significant. ***(**)[*] stands for 1% (5%) [10%] significant.*

Table 2 shows the results of the estimation of the different specifications of our growth model.

In a first step, growth is regressed on initial GDP, the investment rate and the years of education. All coefficients in the first column have the expected signs. Growth depends negatively on initial GDP, indicating β-convergence. The investment rate enters positively (see for example Barro, 1991; Levine and Renelt, 1992). Turning to education, most authors find that the overall level of education is growth enhancing (see for example Barro, 1991).[1]) Our positive coefficient for the average years of education seems to support this result, although it is not significant at the 10% level. A similar result is found, for example, by Levine and Renelt (1992).

In a second step, the inflation rate, government consumption over GDP and openness of the economy are added to the model as variables. The inclusion of these three variables does not change the signs of the first three factors, as can be seen in the second column. Inflation enters the equation with a negative sign, indicating the growth-hampering effect of high increases in the price level (for a detailed study on this relationship, see Barro, 1995). The minus sign of the coefficient for the government consumption ratio implies a negative relationship between government expenditure and growth. Other empirical studies, for example Barro (1991) and Barro (1997), also found this result. The intuition is that government spending has only a temporary influence on growth while in the long run, the growth-hampering impact of high debt levels as a consequence of excessive government spending as well as possible allocative inefficiencies predominate. In our case, however, the coefficient is not significant (a result also found by Levine and Renelt, 1992). Finally, the coefficient for the openness of the economy is significant and shows the expected positive sign, supporting the view that trade stimulates growth. This result is also found by Harrison (1995) and Sachs and Warner (1995).

In the final step, the model is modified by inclusion of the subperiod-average number of years since a country's accession to the European Union. Notice that the trade variable already controls for openness, so the EU membership variable

1 *There is, however, some indication that primary education has a negative impact on growth; see, for example, Barro (1997).*

will reflect growth effects of regional integration different from those directly related to trade.[1]) The positive and significant coefficient in column 3 indicates that the longer a country has been a member of the EU, the more it profits from membership. The inclusion of this new variable leaves the signs of the other coefficients unchanged. The coefficient for education is still positive, but it is now significant at the 5% level. This extended model explains 78% of the variation in growth.

To check for robustness, the model is also estimated without government consumption, as the coefficient proved insignificant in models 2 and 3. However, the other coefficients remain practically unchanged, some of them becoming even more significant. This strengthens the robustness of our previous results.

The effect represented by the coefficient of the variable $YEA_{t,i}$ affects only countries that have been members of the EU for at least one year in a given subperiod. It could be the case, however, that a larger, regionally integrated space has an effect also on the growth rates of countries that do not form part of it yet. In order to check for this possibility and to shed a light on whether membership is actually required for gaining growth benefits from regional integration, the model was reestimated by replacing $YEA_{t,i}$ with a scale variable common to all countries but variable in time, which captures the size of the regionally integrated unit. We used three different specifications of the scale variable (aggregate population, aggregate GDP and aggregate labor force), and the coefficient always appeared positive, but insignificant. Therefore, the growth benefits associated with regional integration seem to be due to formal participation in the EU.

Another objection to our conclusion could be that it is not EU membership itself that enhances growth, but that the accompanying stability measures for nominal macroeconomic variables had a positive impact on growth performance. Partly this was already accounted for by including the inflation rate as an explanatory variable. To check in addition for the impact of a potential decrease in the exchange rate volatility caused by EU membership, the standard deviation of the exchange rate against the U.S. dollar for each country was included as an additional independent variable. However, its coefficient appeared insignificant in all specifications. This indicates that exchange rate policy does not explain the existence of a growth bonus associated with EU membership.

To sum it up, our model so far explains a considerable part of the variation in growth, and the results strongly support the hypothesis of (conditional) β-convergence: poorer countries have caught up with the richer ones since the 1960s, and the rate of convergence is found to be between approximately 3.5 and 5.5%, depending on the specification used.[2]) Furthermore, the coeffi-

1 *The fact that our openness variable is defined as trade over GDP implies that trade-related technology absorption is already partly captured by the positive coefficient for $OP_{t,i}$. This is expected to actually reduce our coefficient for the impact of the EU membership variable and reinforces the importance of technological spillovers as a driving force for growth.*

2 *The rate of convergence has been computed as $\lambda = -[1 - \exp(\beta T)] / T$, where β is the coefficient corresponding to initial GDP per capita, and T is the subperiod length. The expression for λ results from the log linearization around the steady state in the classical Solow model.*

cients support the hypothesis of a positive impact of investment, education and openness on growth, as well as a negative impact of high inflation rates. Finally, the results not only point toward a growth-enhancing effect of EU membership, but they also show that this effect gained importance over the duration of membership.

3.2 Who Profits Most from EU Membership?

One interesting extension to the basic models is to look in more detail at the finding that EU membership is growth enhancing and furthermore becomes even more so the longer a country belongs to the grouping. A particularly interesting question is whether a subgroup of countries profited more from EU membership than other countries. The idea is to divide the sample of countries into subsets with respect to one of the other variables and to investigate whether the coefficient for the years of membership differs significantly across subgroups.

One basic way to do that would be to split the sample according to rules defined a priori. For example one could define poor, medium and rich countries by setting the borderline income levels. The threshold panel data technique, however, offers a more neutral approach. It allows to test whether such subgroups can be found at all and how many subsets are appropriate. Furthermore, it estimates explicitly the borderline income levels. The main advantage of this approach is that it avoids ad hoc definitions of subgroups, but tests the hypothesis of the existence of subsets against the alternative of no division of the sample.

In our extension of the basic model we test whether countries with a lower initial per capita income level profited more or less from EU membership than more developed countries. If subsamples according to initial income levels can be identified and the coefficient for the years of EU membership is significantly higher for initially poorer countries, this would be an indication of increased economic convergence as a consequence of European integration. If, however, we get the opposite result, this would indicate that the initially richer countries are also the ones which profit most from intensified economic involvement.

Table 3 gives the results of the threshold estimation, and table 4 presents the parameter estimates of the threshold model.[1]) The estimation procedure identifies exactly one threshold at a level of (log) initial GDP per capita equal to 9.8 (approximately USD 18,000). A 95% confidence interval around

Table 3

Testing for Linearity

	Single Threshold $\hat{\gamma}$	Double Threshold $\hat{\gamma}_1$	$\hat{\gamma}_2$
Initial GDP per-capita (logged)	9.80	9.25	9.80
Bootstrap p-value	0.027	0.169	

Source: OeNB.
Note: Bootstrap p-values based on 1,000 replications. Threshold values found by grid search in the central 50% of the distribution of the threshold value.

1 *For literature on the threshold panel data estimation, see for example Baltagi (1995), Hansen (1996), Hansen (1999) and Andrews and Ploberger (1994).*

Table 4

Threshold Panel Data Regressions

Model	1 T	2 T
Initial GDP	−4.09*** (0.68)	−4.47*** (0.65)
Investment Rate	0.14*** (0.04)	0.16*** (0.03)
Years of Education	0.17 (0.14)	0.20 (0.13)
Inflation Rate	−0.13** (0.03)	−0.13*** (0.03)
Government Consumption	−0.05 (0.09)	–
Openness	0.05** (0.02)	0.05** (0.02)
Years in the EU × $I(y_{0t} \leq \hat{\gamma})$	0.09*** (0.02)	0.09*** (0.02)
Years in the EU × $I(y_{0t} \geq \hat{\gamma})$	0.04*** (0.01)	0.04*** (0.01)
Observations	56	56
R^2_{adj}	83.2%	83.4%

Source: OeNB.

the threshold estimate computed using the empirical likelihood function is [9.70, 9.81]. The test for linearity rejects the null of no threshold effect at a 5% significance level, and the null of one threshold cannot be rejected when tested against the alternative of two thresholds.

Looking at the original data set, we see that at the beginning of our sample, that is in 1960, all countries had an initial income level below the threshold. In 1970 Denmark and Sweden had broken through the threshold. Ten years later, six more countries had followed and only the incomes of Greece, Ireland, Italy, Portugal, Spain and the United Kingdom remained below the threshold. In 1991, finally, the income levels in Italy and the UK exceeded the threshold income level, so that the subgroup of less developed countries was now limited to the classical catching-up countries Greece, Ireland, Portugal and Spain. Towards the very end of our data set, the income level of Ireland, which recently experienced two-digit growth rates, exceeded the threshold level.

The next step is to divide the sample in each period according to this threshold and rerun the panel regressions. The results are shown in table 4, where we now have a separate coefficient for the length of EU membership for each subgroup. The coefficient for the years of EU membership is positive and significant for both subgroups. Furthermore, we find that the coefficient differs significantly across groups and is significantly higher for the countries with lower initial income levels. All the other coefficients show the expected signs. The new model, which splits the countries into two subgroups according to their initial income levels, explains around 83% of the variation in growth.[1])

Hence, while countries with a higher level of development grew faster the longer they were members of the EU, this effect is even more pronounced for the subgroup of less advanced countries.[2]) This finding can be interpreted as another indication for a catching-up process of poorer towards richer countries in Europe in the sense that with two countries entering the EU at the same point

1 *To check for robustness the model was reestimated using Switzerland as an external control country. The coefficients remained similar in terms of sign, range and significance. The goodness of fit, furthermore, improved considerably. The results are not reported in the tables and are available upon request from the authors.*

2 *The exercise was repeated using the relative level of GDP per capita with respect to the average of current Member States as a threshold variable. However, the test for linearity could not reject the null of linearity at any reasonable significance level. This suggests that it is the absolute level of development of the country that determines the asymmetric effect of EU membership on long-term growth.*

in time the growth bonus is larger for the less advanced country.[1]) Not only do our results show that countries with lower initial incomes grew faster than the more advanced countries (β-convergence), the estimates also imply that countries that exhibit per capita income levels below the threshold profit more from long-term EU membership than richer countries.[2])

4 Conclusions and Prospects for Further Research

The empirical study performed in this paper shows that EU membership has had a positive and asymmetric effect on long-term economic growth. As the model specification uses openness as a control variable, the growth effect picked up by the regional integration variable differs from that resulting from intensified trade and would relate to the improvements in the transmission of technological knowledge among the EU Member States. The results may be seen as constituting new empirical support for the endogenous growth theory and would imply that it is the relatively less developed countries that profit most from access to the broader technological framework offered by the regionally integrated unit.

However, one could argue that technology is not the only factor explaining the growth bonus associated with EU membership. One argument that may also be used to interpret the results relies upon the assumption that financial help from the EU to relatively poorer members actually does have an effect on long-term growth. In fact the EU budget generated major net financial transfers to the four cohesion countries – Greece, Portugal, Ireland and Spain.[3]) In 2000, these net transfers accounted for 3.6% of Greek GNP, 1.9% of Portuguese GNP, 1.8% of Irish GNP and 0.9% of Spanish GNP. To a lesser extent, Finland, Denmark and Italy also showed positive net balances (see European Commission, 2001).

Are these transfers successful? To answer this question, the European Commission runs several macroeconomic models (for an overview see the 6th Periodic Report of the European Commission 1999). The Beutel model, for instance, is used to investigate how much of the economic growth in the Member States covered can be attributed to EU cofunded programs and EU grants. According to the model, EU transfers during the two programming periods (1989 to 1993 and 1994 to 1999) are found to have increased GDP growth in the four cohesion countries by an average of 0.5 percentage point in the first period and 0.7 percentage point in the second period.

As a result, income disparities have been reduced, and the gap in GDP per capita between the four cohesion countries and the rest of the European Union

1 This, however, does not imply that this growth bonus has actually led to absolute convergence of the EU Member States. The different entry dates and the cumulative nature of the growth bonus has led to several more advanced economies profiting relatively more from integration.

2 In order to check whether the effect – or absence of the effect – of government consumption on growth differs depending on the absolute level of government consumption in a country, we checked the results for the inclusion of an extra threshold effect on the parameter of government consumption, with the level of government consumption itself as a threshold variable. The test, however, was not able to reject the null of linearity at any sensible significance level.

3 The Cohesion Fund was established in 1993, after the Mediterranean countries Greece (1981) and Spain and Portugal (1986) had joined the European Union. Cohesion countries are EU member countries whose GDP per capita is lower than 90% of the EU average.

has narrowed (the average GDP per capita in the four cohesion countries went up from 65% of the EU average in 1986 to 78% in 1999). The overall result of a number of macroeconomic models is that one third of the reduction in disparities is due to the Structural Funds (Moucque, 2000). Therefore EU transfers should be taken into account when analyzing the process of convergence. However, the nonavailability of proper time series has prevented an implementation of such a variable into our model so far.

Fölster and Henrekson (2001) find a robust and negative relationship between government size and economic growth. This could provide another possible explanation for our result that EU membership had a positive impact on growth, as due to liberalization measures inherent to the integration process the size of the government in EU Member States has decreased rapidly in the last decades. Possible other sources of the growth bonus could be the stabilization of expectations in the context of the European Exchange Rate Mechanism or the preparations for monetary union. The dollar exchange rate, which was implemented into our model without any significant result, can be seen as only a first step to cover this exchange rate effect.

Another possible source of the growth bonus are the changes in the institutional framework due to European integration. Whereas the completion of the internal market or, in other words, the openness of the countries is covered more or less by the trade variable, there are other developments which could also play a role. Examples are the legal and the institutional framework of the financial sector, the scale and the nature of foreign direct investment, transport infrastructure and the efficiency of public administration.

To sum it up, the uncertainty surrounding the nature of the underlying driving factors only allows for a rejection of the basic neoclassical growth model. Further research would have to be done, however, to test the empirical validity of the endogenous growth model, as the fact that technological spillovers do indeed drive our result cannot be extracted directly from our study.

One interesting question would be whether our results allow implications about the EU enlargement process. In terms of pure GDP per capita levels, some countries (Slovenia, the Czech Republic, Hungary and Slovakia) have already reached a GDP per capita level (in percent of the EU-15) which is similar to or even above the one Greece showed at its EU entry in 1981. But as our study is based on historical data for the current EU Member States, we cannot directly apply the findings to the potential accession countries. The structural and institutional differences in these economies as compared to the current Member States are sometimes huge, and even the fact that the income levels of all candidate countries currently lie below our estimated threshold does not allow for the conclusion that these countries will indeed profit more than average from EU membership. Additionally, one should take into consideration that these economies not only undergo an accession, but also a transformation process. This also limits the applicability of our results.

Finally, let us draw some policy conclusions. There seems to be a growth bonus associated with formal EU membership. Our model indicates the presence of knowledge spillovers, so it is not only trade that matters. This growth bonus gains importance over time, underpinning the fact that European integration is a long-term concept and, even more importantly, that the growth

bonus in the EU is still working. Additionally, we have found an asymmetric effect on long-term growth, so obviously European integration drives convergence. The results fit into the picture that nominal and real convergence stand next to each other as equal goals of the EU and are being successfully pursued.

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