In search for accumulative effects of European economic integration

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Abstract:

The forthcoming eastern enlargement of the European Union is generally perceived to constitute one of the most significant challenges to the process of European integration so far. The economic impact of the enlargement is likely to be considerable. The enlargement, as any other previous episodes of integration deepening or widening, is going to trigger various static as well as dynamic effects. Due to the increase in internal heterogeneity of the economic block, the effects are likely to be spatially asymmetric. From the point of view of both existing as well as acceding member states the dynamic growth or accumulative effect understood as a permanent change in the long-term average growth rate of GDP per capita is especially appealing. However, theoretical and empirical studies are rather inconclusive as to the very existence, direction and significance of long-term growth effects of economic integration in general and of European integration process in particular. The present study attempts to shed some light on the issue. The study utilizes a two-way panel data approach to analyze a balanced panel of data composed of a group of 20 developed countries covering eight consecutive subperiods between 1960-1999.

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I. Introduction

The forthcoming Eastern enlargement of the European Union will significantly alter the economic as well as geopolitical landscape of Europe. For many reasons it should be perceived as a final step on the path towards comprehensive integration of a formerly divided continent. From Eastern-European perspective it could be perceived as a completion of the most difficult stage of economic transition of former centrally-planed economies towards the status of fully-functioning market economies.

The economic impact of the enlargement is likely to be considerable. In certain studies the potential economic impact of the enlargement is straightforwardly compared to the impact of completion of the internal market program (see for instance Wim Kok 2003). The enlargement, as any other previous episode of integration deepening or widening, is going to trigger various short-term or static as well as long-term or dynamic effects. The literature of the subject distinguishes also between allocation efficiency, location and accumulative effects (Baldwin 1994). As a direct result of the enlargement we will observe a severe increase in internal heterogeneity of the economic block. The effects of the enlargement are thus likely to be characterized by significant spatial asymmetry both between the member states and regionally within the member states.

From the point of view of both existing as well as acceding member states the participation in the EC/EU should be perceived as rational in economic terms only if the long-term benefits of membership neutralize or outweigh its cost. The potential for a positive long-term growth effect (accumulative effect in the Baldwin terminology) understood as an increase in long-term average growth rate of GDP per capita is generally perceived as one of the most prominent factor affecting the choice of member on non-member status. This applies especially to the case of less developed country joining a group of advanced economies with potential for accelerated speed of convergence. However, both theoretical and empirical studies are rather inconclusive as to the issue of very existence, direction and significance of long-term growth effects of economic integration in general and of the European integration process in particular.

The present study aims to empirically verify the existence of accumulative effects related to the membership in the most advanced regional integration arrangement so far that is of the European Union. Section II presents a brief summary of main theoretical aspects related to the issue of potential growth effects of economic integration. Section III briefly reviews the major empirical studies on the subject. Section IV analyzes the stylized facts on growth performance of EC/EU member states with the emphasis put on detecting significant shifts in medium-term growth rates averages around the time of accession, consecutive enlargements and completion of major stages in the integration process – formation of customs union and internal market as well as the introduction of euro. Section V investigates the potential long-term growth effects of EU – membership with an analysis of a balanced

two-way panel model for a sample of 20 developed states in the period 1960-1999. It is followed by concluding remarks.

II. Theoretical background

Literature of the subject distinguishes between the so-called medium-term and long-term growth effects of economic integration (e.g. Baldwin 1994). Medium-term growth effects occur as a consequence of shifts in the general level of productivity attributed the formation, deepening or widening of a regional integration agreement. The productivity shifts in turn induce accelerated physical capital formation that gradually diminishes towards its long-term steady state. The medium-term effect is consistent with the neoclassical growth theory, attributed predominately to Solow (1956), within the framework of which economic integration as any other major economic policy change can affect the growth only on the transition path leading towards the steady-state. However, the neoclassical growth theory based on an udelying assumption of diminishing returns to accumulative factors cannot accommodate permanent changes in the long-term growth rates of GDP per capita or the long-term effects of economic integration. The growth process itself is explained only by the reference to exogenous technological change. This will be also the case if we extend the definition of capital to accommodate apart from physical capital, human and knowledge capital as well (see for instance Mankiw et al. 1992).

The permanent or long-term effects of economic integration find their theoretical foundations in the endogenous growth theory (the so-called new growth theory) which assumes non-diminishing returns to the accumulation of broadly defined capital. Within the framework of the endogenous growth theory several types of models can be distinguished (McCallum 1996). These include models featuring externalities resulting from linked capital-and-knowledge accumulation (e.g. Romer 1986), accumulation of human capital (e.g. Lucas 1988) as well as growing stock of existing product designs or horizontal differentiation of products (e.g. Grossman and Helpman 1991).

The new growth theories allow for long-term growth effects of economic integration and provide for many direct and indirect channels through which that effects could be potentially induced (for a survey please refer to Walz 1997). Economic integration can induce growth effects indirectly through its impact on capital accumulation, savings or technological change. Depending on the stage of the economic integration process knowledge spillovers can be primarily induced by trade or the free flow of factors of production. Economic integration can furthermore induce growth through various adjustments in the R&D sector. The most prominent channel is off course trade that can induce both investment-led as well as technology-led growth. Economic integration can also affect the long-term growth performance through the scale effects in the IRS sectors.

There exists a growing number of models that explicitly deal with the issue of growth effects of economic integration. These include among others: Rivera-Batiz and Romer (1991,1994), Grossman and Helpman (1991), Devereux and Lapham (1994), Frenkel and Trauth (1997). It is worth to note that a new approach to modeling of dynamic consequences of economic integration has emerged in late 1990's. It extended the endogenous growth framework to accommodate for spatial dimension (e.g. Baldwin and Forslid 2000). Within this new class of models growth and location of production are endogenously and simultaneously determined.

Despite the progress made recently in theoretical research on the dynamic effects of economic integration, as Waltz (1997) rightly points out, many open issues still remain. This applies especially to the modeling of consequences of liberalization of FDI flows or completion of economic and monetary union.

III. Previous empirical studies

The preceding studies devoted to the analysis of potential growth effects of European economic integration within the framework of EC/EU or economic integration in general have utilized different econometric approaches. These included: time-series analysis (e.g. Landau 1995, Vanhoudt 1999), standard growth regression analysis (e.g. Henrekson et al. 1996) or data panels (e.g. Torstensson 1999). The potential growth effects were analyzed directly or indirectly through investigation of potential channels that have been briefly outlined in the preceding section.

The results of the empirical studies concerned with the long-term growth effects of economic integration in general and European economic integration in particular are rather inconclusive. Some studies point to the existence of a positive and statistically significant long-term effect of membership in the European Union. The study by Henrekson et al. (1996) estimated cross-sectional growth regressions for a sample of 115 countries and various specifications. Authors identified positive and statistically significant effects of membership in the EC and EFTA on economic growth. It showed furthermore that there was no significant difference between the membership in either of the regional integration arrangements.

Torstensson (1999) conducted an analysis of a data panel consisting of 20 OECD countries and covering three time periods between 1976 and 1990. In an indirect analysis he empirically identified two channels linking economic integration to growth through investment and knowledge transfers.

In contrast, other studies find no significant growth effects related to the membership in the EU whatsoever. The study by Landau (1995) found that there had been no statistically significant difference between the growth of EEC member and non-member countries in a sample of 17 OECD countries in the period of 1950-1990. This would suggest that the there was no long-term growth effect associated with the membership in the EC.

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Utilizing panel data analysis for 23 OECD countries (five observations for each state considered in the panel) Vanhoudt (1999) found no positive or negative growth effects for EC members in comparison to non-member OECD states. The analysis of the time-series data for EU member states showed time series for economic growth to be stationary around two trend lines time series for growth before and after the structural break of 1973.

Lastly, in an interesting study Vamvakidis (1999) showed that participation in a regional integration arrangements (RTAs) has been on average associated with slower growth rates than the policy of broad liberalization.

The general conclusion to be drawn from the aforementioned empirical research is that the results obtained are very sensitive to the use of different econometric approaches, the choice of data samples and control variables. Furthermore, the empirical studies have not provided clear-cut answers so far.

IV. Mid-term Growth Performance Before and After Accession to EC/EU

In this section we will try to analyze the stylized facts on growth performance of European Community and European Union member states[1] in order to detect significant shifts in medium-term growth rates averages around the time of accession, consecutive enlargements and completion of major stages in the integration process[2]. These include the formation of customs union (1968) and of internal market (1993) as well as the introduction of the common currency – euro (1999). In the interpretation of the stylized facts we should remember that this kind of a straightforward analysis is biased in a number of ways. The data come from the Penn World Table version 6.1. (Heston et al. 2002).

According to the evidence provided in Table 1 7 member states of the EC/EU out of 14 considered experienced an absolute increase in the 5 yr average growth rates of real GDP per capita after the accession in comparison to the situation before the accession. On the other hand, 6 out of 14 suffered a decrease and an effect for France was roughly neutral. Despite the positive average effects for all 14 countries considered (an increase of 0.66 per cent), the stylized facts are therefore inconclusive as to the mid-term growth impact of accession. It is however obvious that the observed shifts are to a large extent influenced by factors directly or indirectly outside the realms of European economic integration. It seems that two factors are the most prominent: global economic considerations and the general direction of economic policy around the time of accession. The only conclusion we can draw from the stylized effect is that accession alone will not guarantee a mid-term improvement in growth performance.

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[1] For a number of reasons Germany is considered to be an outlier and is not included in the subsequent analysis.
[2] We take into account 5yr averages as they neutralize some of the potential cyclical instability of growth rates.

Table 1 Medium-term growth performance before and after accession to EC/EU

	Year of accession	Real GDP growth rates (5yr averages)		
		before	after	abs. change
Belgium		2,92	3,18	0,27
France		3,84	3,83	-0,01
Italy	1958	4,83	6,29	1,47
Netherlands		5,48	2,04	-3,44
Luxemburg		2,89	1,11	-1,78
Core - initial MS		**3,99**	**3,29**	**-0,70**
United Kingdom		2,47	1,98	-0,49
Denmark	1973	3,33	0,97	-2,36
Ireland		4,11	3,17	-0,94
1st enlargement		**3,76**	**2,87**	**-0,89**
Greece	1981	2,61	-0,62	-3,23
2nd enlargement		**2,61**	**-0,62**	**-3,23**
Spain	1986	0,47	4,14	3,67
Portugal		0,37	5,79	5,42
3rd enlargement		**0,42**	**4,97**	**4,55**
Austria		1,61	2,11	0,50
Finland	1995	-2,31	4,31	6,62
Sweden		-0,70	2,81	3,51
4th enlargement		**-0,47**	**3,08**	**3,55**
EC/EU average		**2,28**	**2,94**	**0,66**

Source: Own calculations based on PWT 6.1 – variable considered GRRGDPCH growth of real GDP per capita chain index – constant price entry.

As Vanhoudt (1999) rightly points out, the nucleus of the non-convex endogenous growth theory is the so-called scale effect. The larger the scale of an economy, the higher its long-run growth rates. If we assume therefore that endogenous growth theory is correct, the consecutive enlargements of the EC/EU should be accompanied by positive adjustments in the average growth rates of the integration block's initial member states – that is Belgium, France, Italy, the Netherlands, Luxemburg and Germany (which is not considered). On the basis of evidence provided in Table 2 we cannot make a clear-cut judgment on these theoretical considerations. The effects of 1973 and 1981 enlargements are negative but at the same time they are significantly biased by a general downturn in the world economy during this particular period. The Iberian enlargement of 1986 and northern enlargement of 1995 have directions and noteworthy strengths anticipated by the theory.

Table 2 Mid-term growth effects of consecutive enlargements for initial EC/EU Member States

		Real GDP growth rates (5yr averages)		Absolute change
		before	after	
1st enlargement	Belgium	4,61	2,65	-1,97
	France	4,33	2,39	-1,94
	Italy	3,97	2,94	-1,03
	Netherlands	3,86	2,29	-1,57
	Luxemburg	4,22	0,38	-3,84
	Average	**4,20**	**2,13**	**-2,07**
2nd enlargement	Belgium	3,00	0,74	-2,26
	France	2,96	1,22	-1,73
	Italy	3,92	1,46	-2,46
	Netherlands	1,86	0,72	-1,14
	Luxemburg	1,87	2,30	0,43
	Average	**2,72**	**1,29**	**-1,43**

	Belgium	0,74	3,20	2,46
	France	1,22	2,99	1,77
3rd enlargement	Italy	1,46	3,28	1,82
	Netherlands	0,72	2,94	2,22
	Luxemburg	2,30	5,89	3,59
	Average	**1,29**	**3,66**	**2,37**
	Belgium	1,09	2,33	1,24
	France	0,31	1,87	1,57
4th enlargement	Italy	0,83	1,83	1,00
	Netherlands	1,56	3,00	1,44
	Luxemburg	3,78	4,96	1,18
	Average	**1,51**	**2,80**	**1,29**

Source: Own calculations based on PWT 6.1 – variable considered GRRGDPCH growth of real GDP per capita chain index – constant price entry.

Now we turn to the analysis of evidence of mid-term growth effects of completion of major stages in the process of continuing deepening of European integration. The first major stage of the economic integration within the EC framework was the completion of the customs union in 1968. It was marketed by an introduction of common external tariff (CET) with third-countries and liquidation of all internal barriers to free flow of goods. On the basis of the evidence provided in Table 3 we can conclude that the average effect for the 5 MS considered was positive and of relative significance.

The evidence on impact of the completion of the internal market program on the mid-term growth performance of the MS is rather surprising. The individual reaction patterns vary greatly. In general the completion of the internal market was market by an absolute decrease in 5yr average growth rate of 0.42 per cent. Only three countries experienced a positive absolute shift – by a matter of pure coincidence all of them entered the EC/EU. On the other hand, the evidence on the consequences of the introduction of the common currency are generally positive for the participating countries (with an exception of Italy) and are rather mixed for non-participating ones – on average they are neutral.

A quick and simple exercise we have carried out above points clearly to the conclusion that we should employ more sophisticated empirical techniques in evaluating the potential growth effects attributed to the membership in EC/EU. As the reaction patterns vary greatly between the MS and time periods, the more sophisticated studies should take into account country specific characteristics and developments in the global economy within analyzed periods. In addition, the analysis should take into account the steadily growing number of member states as a corollary of consecutive enlargements as well as direct and indirect consequences of integration deepening marked by completion of major stages in the process of economic integration.

Table 3 Growth effects of completion of major stages of economic integration process within EC/EU*

EC/EU major stages		Real GDP per capita growth rates (5yr averages)		Absolute change
		before	after	
Completion of Customs Union (1968)	Belgium	3,76	4,61	0,86
	France	4,31	4,33	0,02
	Italy	3,87	3,97	0,10
	Netherlands	3,56	3,86	0,30
	Luxemburg	1,81	4,22	2,42
	Average	**3,46**	**4,20**	**0,74**
Completion of Common Market (1993)	Belgium	2,71	1,45	-1,27
	France	1,78	0,66	-1,13
	Italy	2,55	1,20	-1,36
	Netherlands	2,58	2,04	-0,53
	Luxemburg	5,54	5,29	-0,25
	United Kingdom	1,02	2,88	1,86
	Denmark	0,93	2,37	1,44
	Ireland	5,09	6,57	1,48
	Greece	1,80	1,49	-0,31
	Spain	2,93	1,80	-1,13
	Portugal	4,86	1,43	-3,43
	Average	**2,89**	**2,47**	**-0,42**
Completion of EMU (1999) participating MS	Belgium	1,56	3,20	1,64
	France	1,11	2,62	1,52
	Italy	1,30	1,19	-0,11
	Netherlands	2,31	2,84	0,53
	Luxemburg	5,16	5,18	0,03
	Ireland	6,68	9,43	2,75
	Greece	2,68	3,90	1,23
	Spain	2,19	3,50	1,31
	Portugal	1,87	4,33	2,46
	Austria	2,02	2,64	0,62
	Finland	4,30	4,51	0,21
	Average	**2,83**	**3,94**	**1,11**
Completion of EMU (1999) non-participating MS	United Kingdom	2,86	2,08	-0,78
	Denmark	2,39	2,33	-0,05
	Sweden	2,67	3,43	0,76
	Average	**2,64**	**2,62**	**-0,02**

*Greece joined EMU in 2000, due to the availability of data 2yr averages are given for the post-EMU period.
Source: Own calculation based on PWT 6.1 – variable considered GRRGDPCH growth of real GDP per capita chain index – constant price entry.

V. Long-run growth effects of EC/EU membership – a data panel analysis

The preceding studies devoted to the analysis of potential growth effects of European economic integration within the framework of EC/EU have utilized different econometric approaches. These included: time-series analysis (e.g. Landau 1995, Vanhoudt 1999), standard growth regression analysis (e.g. Henrekson et al. 1996) or data panels (e.g. Torstensson 1999). In the present paper we will utilize panel data analysis.

In order to investigate the impact of EC/EU membership on long-run growth rates we have put together a panel of data for a group of 20 developed countries – 13 out of 15 current member states of

the European Union[3] and seven reference countries: Australia, Canada, Israel, Japan, Norway, Switzerland and the USA. The data panel is balanced – it consists of eight observations for each of the 20 countries considered and covers the period of forty years from 1960 to 1999 divided into aforementioned eight successive quinquennial subperiods giving a total of 160 observations. We are interested in testing the following hypothesis:

- whether or not EC/EU membership had an effect on economic growth in comparison to a reference group of developed countries that did not participate in the western European integration process ,

- whether the potential growth effect was positive, negative or neutral.

One of the most prominent features of a panel data analysis is its ability to distinguish between the individual effects which are specific to every country considered and the time effects which capture period-specific characteristics (for instance variations in global GDP). This feature is especially appealing when we focus on the analysis of long-run growth effects of participation in regional integration arrangements (RTAs) which as Torstensson (1999) rightly points out is dynamic per se. This is also appealing when we take into account a significant heterogeneity of existing MS of the EC/EU. We expect to observe significant variation of potential growth effects within the group. This is exactly the point made in Section IV. To allow for this distinction we construct a two-way panel model which is based on assumption that the individual and the time effects are additive and independent from each other[4].

As in many other empirical studies dealing with long-run growth effects the dependent variable is the growth rate of real gross domestic product per capita (GROWTH). It enters the model as a 5yr average calculated for every country and one of eight given subperiods. On the RHS we include several standard explanatory variables that are consistent with stylized facts on growth, proponents of augmented neoclassical growth model as well as to some extent proponents of the new growth theory. The choice of explanatory variables is also consistent with an influential paper by Levine and Renelt (1992). These are: logarithm of initial real GDP per capita level at the beginning of every subperiod considered (logIGDP) as well as 5yr averages of constant price entries of investment as a share of real GDP (INV), government share of real GDP (GOV) and the 5yr average of population growth rates (N). The data source for GROWTH, logIGDP, INV, GOV and N are Penn World Table 6.1. (Heston et al. 2002). These standard explanatory variables are supplemented with 5yr averages of years of schooling of total population over 25 to control for differences in human capital endowments between nations considered taken from a data set on educational attainment by Barro-Lee (2002).

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[3] Germany is considered to be an outlier, Luxemburg is dropped out from the further analysis due to the lack of data on human capital.
[4] One-way panel model would take into account only individual effects and therefore would implicitly make an assumption that all heterogeneity related to time could be captured by observed heterogeneity.

The standard explanatory variables are supplemented with time and country dummies to obtain a two-way panel data model. Time dummies A to G cover seven consecutive subperiods considered in the analysis: 1965 – 1969, 1970 – 1974, 1975 – 1979, 1980 – 1984, 1985 – 1989, 1990 – 1994 and 1995 – 1999. They are followed by country dummies for Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Denmark (DEN), Spain (ESP), Finland (FIN), France (FRA), United Kingdom (GBR), Greece (GRC), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), the Netherlands (NLD), Norway (NOR), Portugal (POR) and Sweden (SWE). In order to simplify the analysis their estimates are omitted in the OLS estimation results table (Table 4).

These are in turn supplemented with dummy variables for integration (DVEU) to evaluate the effects of membership in the European Union. We obtain a general equation which is linearly estimated using OLS:

$$\begin{aligned} \mathbf{GROWTH} = &\ \alpha + \beta_1 \mathbf{A} + \beta_2 \mathbf{B} + \beta_3 \mathbf{C} + \beta_4 \mathbf{D} + \beta_5 \mathbf{E} + \beta_6 \mathbf{F} + \beta_7 \mathbf{G} + \beta_8 \mathbf{AUS} + \beta_9 \mathbf{AUT} + \beta_{10} \mathbf{BEL} \\ &+ \beta_{11} \mathbf{CAN} + \beta_{12} \mathbf{CHE} + \beta_{13} \mathbf{DNK} + \beta_{14} \mathbf{ESP} + \beta_{15} \mathbf{FIN} + \beta_{16} \mathbf{FRA} + \beta_{17} \mathbf{GBR} + \\ &\ \beta_{18} \mathbf{GRC} + \beta_{19} \mathbf{IRL} + \beta_{20} \mathbf{ISR} + \beta_{21} \mathbf{ITA} + \beta_{22} \mathbf{JPN} + \beta_{23} \mathbf{NLD} + \beta_{24} \mathbf{NOR} + \beta_{25} \mathbf{PRT} + \\ &\ \beta_{26} \mathbf{SWE} + \beta_{27} \mathbf{logIGDP} + \beta_{28} \mathbf{N} + \beta_{29} \mathbf{INV} + \beta_{30} \mathbf{GOV} + \beta_{31} \mathbf{AYS} + \beta_{32} \mathbf{DVEU} + \varepsilon \end{aligned}$$

Three distinctive variables for European Community/European Union membership are constructed and enter the regression independently (three independent regressions numbered R(1), R(2) and R(3) are thus estimated). In the first regression (R1) we include a zero-one dummy variable (EU) which is commonly utilized in the studies on the subject of interest. EU takes value of zero for non-member countries and value of one for counties that were or became members of EC/EU within a given subperiod considered. In the second regression (R2), similarly to Vanhoudt (1999), we introduce a dummy for length of membership in the EC/EU (EUT). It takes a value of zero for non-member countries and a value equal to the number of years that a particular country has been a member of EC/EU by the end of a subperiod considered. In the last estimated regression (R3), the effect of membership in EC/EU is given by a proxy for a scale of an integrated market (EUSCALE). It is constructed as a ratio of total population of EC/EU to the total population of a particular MS and enters the equation as a 5yr average for a given subperiod (values of EUSCALE are given in Appendix A). EUSCALE shows how may times the size of an integrated economy exceeds the size of a national economy population-wise. It can be said to capture some of the direct and indirect effects related to gradual expansion of the EC/EU within the context of its consecutive enlargements. At the same time it is a proxy for scale effects envisaged by the non-convex endogenous growth theory. EUSCALE takes a value of zero for non-member countries.

With the exception of the population growth rate, the coefficients on standard explanatory variables have anticipated signs. In three considered specifications of the base regression we observe robust negative partial correlation between the average growth rate and the initial level of real GDP per capita

at the 1 per cent level. This is suggestive of convergence. In all three regressions considered, we find a robust and positive correlation of growth with investment share. The results for these two variables are not sensitive in the understanding of Levine and Renelt (1992). It is however important to note that investment is not exogenous to economic integration process.

Table 4 OLS estimates of the data panel (1960-1999)[5]

Independent variables	R(1)	R(2)	R(3)
constant	0.5436*** (5.871)	0.5321*** (5.841)	0.5427*** (5.954)
logIGDP	-0.0592*** (-5.884)	-0.5989*** (-6.055)	-0.0592*** (-5.971)
N	0.0583 (0.200)	0.0849 (0.297)	-0.0372 (-0.128)
INV	0.0016*** (4.017)	0.0017*** (4.448)	0.0016*** (4.141)
GOV	-0.0006** (-2.027)	-0.0004 (-1.277)	-0.0006** (-2.016)
AYS	0.0034* (1.799)	0.0047** (2.408)	0.0036* (1.927)
EU	0.0032 (0.867)		
EUT		0.0004** (2.3231)	
EUSCALE			0.0002** (2.186)
Country (19) and time dummies (7) Wald test – H0	rejected	rejected	rejected
No. of observations	160	160	160
R^2adj.	64.3%	65.5%	65.4%
SER	0.0113	0.0111	0.0112

Parenthesis give t-statistics. ***,**,* - significant at the 1, 5 or 10 per cent level.

The lack of statistical significance of the coefficient on the population growth rate may be related to the fact that the panel considered in the analysis consists of a limited sample of 20 industrialized countries which could be said to be characterized as having roughly homogenic patterns of demographic development.

The coefficient on the share of government is negative as anticipated. However, it is not significant at the usual level in the second regression. The coefficient on the proxy for human capital endowment –

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[5] In order to eliminate the potential problem of non-normality of the error term we have performed the Shapiro-Wilk test for each of the regressions. The hypothesis of normality of the error term cannot be rejected at any of the usual levels of significance. Furthermore, the hypothesis of homoscedasticity of residuals cannot be rejected at the 5 per cent level.

the average years of schooling in the population over 25 is statistically significant in every regression considered at the 10 per cent level or better.

In the first regression the coefficient on the dummy variable for EC/EU membership is positive. It is not, however, statistically significant at any of the of the usual levels. For this reasons we cannot infer any conclusions. The estimates of the other two regressions, however, prove that there are some statistically significant and positive long-term growth effects associated with the membership in the European Community/European Union. The coefficients on the EUT variable in the second regression and EUSCALE variable in the third regression have positive signs are statistically significant at the 5 per cent level. *Ceteris paribus*, an additional year of membership in the European Union rises the long-term growth rate of real GDP per capita by 0.04 percentage point. *Ceteris paribus*, a one point change in the scale variable (for instance due to enlargement) adds an additional of 0.02 percentage point to the long-term growth rate of real GDP per capita.

These findings go in line with a number of previous empirical studies that have identified positive long-term growth effects of participation in the process of economic integration within the European Community and the European Union.

Concluding remarks

This study has tried to identify potential accumulative or growth effects of EC/EU membership using a two-way data panel model for a balanced panel of 20 developed countries and 8 consecutive quinteannial subperiods. OLS estimation of the model showed that the coefficient on a simple EC/EU dummy variable to be positive but not statistically significant. However, the coefficients on two other proxies for potential effects of EC/EU membership – length of membership as well as dummy for an internal market scale are positive and statistically significant. This could support the general perception that EC/EU membership can induce long-term growth which is not without policy implications. It seems, however, that the results of the present study should be verified in the future with the use of more refined econometric tools not only constrained to panel data approach (for instance with the use of LSVD or GMM) but should also include standard cross-sectional growth regression analysis as well as time series analysis. Furthermore, more emphasis should be put on decomposition of medium-term and long-term growth effects of integration which is particularly difficult in the case of dynamic process of economic integration within the framework of the EU characterized by continued deepening and widening.

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Appendix A Values of EUSCALE utilized in the estimation of R(3)

year	AUT	BEL	DNK	ESP	FIN	FRN	GBR	GER	GRC	IRL	ITA	LUX	NDL	PRT	SWE
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.0	18.8	0.0	0.0	0.0	3.7	0.0	3.1	0.0	0.0	3.4	548.2	15.2	0.0	0.0
1959	0.0	18.9	0.0	0.0	0.0	3.7	0.0	3.1	0.0	0.0	3.4	551.5	15.2	0.0	0.0
1960	0.0	19.0	0.0	0.0	0.0	3.7	0.0	3.1	0.0	0.0	3.5	551.5	15.1	0.0	0.0
1961	0.0	19.1	0.0	0.0	0.0	3.7	0.0	3.1	0.0	0.0	3.5	550.3	15.1	0.0	0.0
1962	0.0	19.3	0.0	0.0	0.0	3.7	0.0	3.1	0.0	0.0	3.5	550.1	15.0	0.0	0.0
1963	0.0	19.3	0.0	0.0	0.0	3.7	0.0	3.1	0.0	0.0	3.5	551.5	15.0	0.0	0.0
1964	0.0	19.3	0.0	0.0	0.0	3.7	0.0	3.1	0.0	0.0	3.5	549.4	14.9	0.0	0.0
1965	0.0	19.4	0.0	0.0	0.0	3.7	0.0	3.1	0.0	0.0	3.5	549.8	14.9	0.0	0.0
1966	0.0	19.4	0.0	0.0	0.0	3.7	0.0	3.1	0.0	0.0	3.5	551.6	14.8	0.0	0.0
1967	0.0	19.4	0.0	0.0	0.0	3.7	0.0	3.1	0.0	0.0	3.5	554.2	14.7	0.0	0.0
1968	0.0	19.5	0.0	0.0	0.0	3.6	0.0	3.1	0.0	0.0	3.5	555.3	14.7	0.0	0.0
1969	0.0	19.6	0.0	0.0	0.0	3.6	0.0	3.1	0.0	0.0	3.5	556.3	14.6	0.0	0.0
1970	0.0	19.7	0.0	0.0	0.0	3.6	0.0	3.1	0.0	0.0	3.5	558.7	14.5	0.0	0.0
1971	0.0	19.8	0.0	0.0	0.0	3.6	0.0	3.1	0.0	0.0	3.5	558.1	14.5	0.0	0.0
1972	0.0	19.8	0.0	0.0	0.0	3.6	0.0	3.1	0.0	0.0	3.5	555.2	14.4	0.0	0.0
1973	0.0	26.5	51.4	0.0	0.0	4.8	4.6	4.2	0.0	84.0	4.7	736.0	19.2	0.0	0.0
1974	0.0	26.6	51.3	0.0	0.0	4.8	4.6	4.2	0.0	82.9	4.7	729.4	19.1	0.0	0.0
1975	0.0	26.5	51.3	0.0	0.0	4.8	4.6	4.2	0.0	81.7	4.7	723.0	19.0	0.0	0.0
1976	0.0	26.5	51.2	0.0	0.0	4.8	4.6	4.2	0.0	80.5	4.7	720.4	18.9	0.0	0.0
1977	0.0	26.5	51.2	0.0	0.0	4.8	4.6	4.2	0.0	79.6	4.7	720.3	18.8	0.0	0.0
1978	0.0	26.6	51.1	0.0	0.0	4.8	4.6	4.3	0.0	78.7	4.6	720.5	18.7	0.0	0.0
1979	0.0	26.6	51.1	0.0	0.0	4.8	4.7	4.3	0.0	77.7	4.6	720.6	18.6	0.0	0.0
1980	0.0	26.7	51.2	0.0	0.0	4.8	4.7	4.3	0.0	77.2	4.7	720.2	18.5	0.0	0.0
1981	0.0	27.7	53.3	0.0	0.0	4.9	4.8	4.4	28.0	79.2	4.8	746.6	19.1	0.0	0.0
1982	0.0	27.7	53.4	0.0	0.0	4.9	4.9	4.4	27.9	78.5	4.8	747.4	19.1	0.0	0.0
1983	0.0	27.8	53.5	0.0	0.0	4.9	4.9	4.5	27.8	78.0	4.8	748.0	19.0	0.0	0.0
1984	0.0	27.8	53.6	0.0	0.0	4.9	4.8	4.5	27.7	77.6	4.8	748.2	19.0	0.0	0.0
1985	0.0	27.8	53.6	0.0	0.0	4.8	4.8	4.5	27.6	77.5	4.8	748.0	18.9	0.0	0.0
1986	0.0	32.8	63.2	8.4	0.0	5.7	5.7	5.3	32.5	91.3	5.7	878.0	22.2	32.3	0.0
1987	0.0	32.9	63.2	8.4	0.0	5.7	5.7	5.3	32.4	91.5	5.7	874.9	22.1	32.4	0.0
1988	0.0	32.8	63.4	8.4	0.0	5.7	5.7	5.3	32.4	92.1	5.7	871.2	22.0	32.6	0.0
1989	0.0	32.8	63.5	8.4	0.0	5.6	5.7	5.3	32.3	92.9	5.8	865.2	22.0	32.8	0.0
1990	0.0	32.8	63.7	8.4	0.0	5.6	5.7	5.3	32.2	93.3	5.8	857.8	21.9	33.0	0.0
1991	0.0	34.6	67.2	8.9	0.0	5.9	6.0	4.3	33.8	98.1	6.1	893.9	23.0	35.1	0.0
1992	0.0	34.6	67.3	8.9	0.0	5.9	6.0	4.3	33.7	97.8	6.1	885.7	22.9	35.2	0.0
1993	0.0	34.6	67.3	8.9	0.0	5.9	6.0	4.3	33.6	97.7	6.1	877.2	22.8	35.3	0.0
1994	0.0	34.6	67.4	8.9	0.0	5.9	6.0	4.3	33.6	97.7	6.1	867.5	22.8	35.4	0.0
1995	46.4	36.8	71.5	9.5	73.1	6.3	6.4	4.6	35.7	103.7	6.5	904.3	24.1	37.6	42.3
1996	46.4	36.9	71.2	9.5	73.0	6.3	6.4	4.6	35.7	103.2	6.5	894.9	24.1	37.7	42.3
1997	46.5	36.9	71.1	9.5	73.0	6.3	6.4	4.6	35.7	102.5	6.5	885.8	24.0	37.8	42.4
1998	46.6	36.9	70.9	9.5	73.0	6.3	6.4	4.6	35.8	101.5	6.5	876.4	24.0	37.7	42.5
1999	46.6	36.9	70.9	9.5	73.0	6.3	6.3	4.6	35.8	100.7	6.5	865.7	23.9	37.8	42.6
2000	46.7	36.9	70.9	9.5	73.1	6.3	6.3	4.6	35.8	99.9	6.6	857.4	23.8	37.8	42.7

Source: Own calculations on the basis of PWT 6.1. data set.