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Growth Effects of European Integration*

by

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Abstract: This paper deals with the effects of European integration in the EC and EFTA on economic growth. Base regressions suggest that EC and EFTA memberships do in fact have a positive and significant effect on economic growth, and that there is no significant difference between EC and EFTA membership. However, this result is not completely robust with respect to changes in the set of control variables and to measurement errors. Nonetheless, the results suggest that regional integration may not only affect resource allocation, but also long-run growth rates. In addition, we explore possible indirect effects of regional integration.

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1. Introduction

It is well known that traditional growth theory predicts no permanent effect of economic integration on the rate of economic growth. At the same time, advocates of regional integration often claim that regional integration has long-run growth effects. This is perhaps most obvious in the European context, where the Cecchini Report (1988) estimated that the EC 1992 Programme would have a once-off effect on EC income but refrained entirely from considering any long-run effects. However, this did not prevent Lord Cockfield, in the very foreword of the report, from stating that "the completion of the internal market will open up: opportunities for growth, for job creation, for economies of scale, of improved productivity... in short a prospect of significant inflation-free growth and millions of new jobs."[1]

Since even a very small increase in the growth rate will soon result in large increases in the standard of living, it is of vital importance to investigate empirically whether any permanent effects on the growth rate as a result of regional integration can be detected.

A first additional step is to account for the medium-term growth bonus (Baldwin, 1992), which may roughly double the static effect. Beginning with Romer (1986) a number of theoretical breakthroughs in the theory of economic growth have made it analytically tractable to construct models where regional integration can have permanent growth effects. This has also paved the way for econometric tests with an acceptable theoretical underpinning. Somewhat surprisingly, little empirical work has been done in evaluating the long-run growth effects of regional integration.[2]

The purpose of the present study is to econometrically evaluate whether any long-run growth effects can be detected from European economic integration, including both EC and EFTA. We make no pretence of presenting a specific theoretical model. Our aim is instead to investigate the phenomenon empirically. Given the vast amount of often conflicting theoretical findings, we find it more appropriate at this stage to construct an empirical model where we allow for different mechanisms of economic growth as opposed to setting up a specific model and testing its

[1]Quoted from Baldwin (1989, p. 248).
[2]The only study we know of is de Melo, Montenegro and Panagariya (1992).

implications. Earlier empirical studies clearly indicated that testable hypotheses derived from a specific theoretical model have been sensitive to the set of control variables included in the regression (Levine and Renelt, 1992). We have therefore undertaken an empirical analysis with a heavier emphasis on the specification and sensitivity of different explanatory variables.

The paper is organised as follows. In section 2 we briefly lay out the theoretical mechanisms which point towards a positive long-run growth effect of regional integration. In section 3, which is the main section of the paper, we present the results from our own tests and section 4 offers some concluding remarks.

Our main finding is that regional integration in Europe may affect not only static efficiency but can also have economically and statistically significant growth effects. However, it should be noted that this conclusion should be treated with caution, a theme which is pursued in the concluding section.

2. Expected Growth Effects of Regional Integration

Using the traditional Solow (1956) growth model as a theoretical point of departure one cannot generate long-run growth effects from regional integration (RI). Through the increased efficiency assumed to follow from the RI a once-off static effect is generally identified. These static effects are invariably found to be very small.[3] The Cecchini Report (1988) calculated a 2.5–6.5 per cent increase in EC income as a result of the 1992 internal market. Gasiorek, Smith and Venables (1992) found a static gain in total factor productivity of 1.5 per cent of the single market programme.

A first further step is to account for the medium-term growth bonus that follows from the once-off increase in income. This increase in income leads to larger savings and a higher marginal productivity of capital, which induces further capital formation. This induced capital formation will eventually stop when the new equilibrium is reached. Baldwin (1992)

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[3]The Cecchini Report (1988) calculated a 2.5–6.5 per cent increase in EC income as a result of the 1992 internal market. Gasiorek, Smith and Venables (1992) found a static gain in total factor productivity of 1.5 per cent of the single market programme.

estimates that this additional medium-run growth bonus from the single market programme is of a similar magnitude as the static effects identified in the Cecchini Report.[4]

A further and far more substantive step is the theoretical developments that have made it possible to identify mechanisms by which regional integration may increase long-term growth rates.

First, there are institutional considerations that suggest possible long-term growth effects of RI. The implications of RI go beyond commodity trade and free mobility of factors of production. It also entails the imposition of a set of reciprocal commitments and obligations. These could be far-reaching, such as the proposed common currency in the European Community. More generally, a tendency towards institutional convergence is likely to emerge. This can lead to superior economic outcomes in several ways (de Melo, Panagariya and Rodrik, 1993). Whether these institutional effects of RI imply static or permanent growth effects is unclear. de Melo *et al.* (1993, p. 183) simply state that "it is likely that dynamic gains, reflected in higher growth, will be reaped."[5]

Second, the recent flurry of endogenous growth models has permitted considerations of a much wider range of mechanisms through which trade can affect economic performance. A common feature of endogenous growth models is that the return to capital is non-diminishing. The definition of capital varies across models, but it is generally a much broader concept than in the original Solow model, including physical, human and/or knowledge capital.

A seminal empirical application of the idea of non-diminishing returns to capital in the RI context is Baldwin (1989). He estimates the long-run growth effect of the EC 1992 Programme by using the Cecchini report's estimate of a once-off raise in EC output by between 2.5 and 6.5 per cent. This estimate is plugged into Romer's (1987) aggregate growth model in which the output elasticity of physical capital is taken to be unity. Using a

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[4]The range of the estimates of the medium term bonus is quite wide. It varies from a low of 30 per cent of the Cecchini Report's static effect up to a high of 126 per cent.

[5]This is of course in line with the conclusions from the so-called new economic history school, where good institutions are seen as a prerequisite for long-run growth (North, 1990; Rosenberg and Birdzell, 1986). For a formal test capturing aspects of the new economic history school, see Torstensson (1994).

reasonable calibration of the model parameters, Baldwin estimates that EC 1992 could lead to an increase in the long-run rate of growth of between 0.28 and 0.92 percentage points, which is a sizeable effect.

In the second generation of endogenous growth models, beginning with Romer (1990), the idea of endogenous innovation looms large. This theoretical avenue offers much better microfoundations for the proposition that economic integration may be growth-enhancing in the long run. Rivera-Batiz and Romer (1991) specifically address this issue. First, countries more integrated into the world economy have access to a larger knowledge base than more isolated countries. In their model the stock of knowledge affects the rate at which new knowledge is generated and this in turn results in a higher long-run growth rate. Second, improved dissemination of technologies by increased exchange of goods and ideas forces firms to develop technologies that are innovative on a global scale and not only new to the domestic market. This will mitigate redundancy in industrial research.[6] Third, economic integration expands the potential customer base substantially, thereby bolstering incentives for R&D. Fourth, in autarky a firm may have a monopoly on innovation in its industry, making it possible to choose not to innovate further and just reap the profits from the current innovation. But with free entry into innovation the firm loses the option to choose between innovation and no innovation (Baldwin, 1993).

However, it must be noted that although these theoretical models identify potential growth-promoting mechanisms that result from increased economic integration in general, they do not specifically address the effect of RI on growth. One would expect the latter effect to be influenced by the policy pursued by the integrated countries towards the rest of the world. This counteracting effect is likely to be of less importance in the case of EC and EFTA, since they have pursued a relatively liberal policy towards nonmember countries. Nevertheless, we deem it important to introduce some control for trade policy vis-à-vis outside countries in order to capture only the growth effect of RI.

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[6]However, Grossman and Helpman (1991, Ch. 9) have constructed several examples where a country's long-run growth rate is lower if it is trading internationally than in autarky. The mechanism at work here is that open trade will increase the profitability of R&D only if a country's firms succeed in the competition with foreign firms. This may be particularly difficult for firms in small and isolated countries, or if the supply of skilled labour is relatively scarce. See also Feenstra (1990).

Thus, we may conclude this section by stating that recent theoretical developments in the literature on the connection between international trade (in goods and ideas) have made it possible to identify possible mechanisms by which RI may permanently increase the rate of growth.

3. Testing the Long-Run Growth Effect

3.1 General Considerations

A fair evaluation of potential integration effects on long-run growth should examine a time period when the initial resource allocation effects can be expected to have faded and integration has been firmly established.[7] In the mid-70s, tariffs had been completely removed within the EC and the free trade agreement between EC and EFTA had gone into effect. Therefore, we have concentrated on a period beginning in 1976. For data limitation reasons the final year of our study is 1985. Second, we included a great number of control variables. Since many, often overlapping, theoretical mechanisms have been identified in the literature, it seems appropriate to account for these effects in the econometric models.

Moreover, we want to be able to separate the direct from the indirect effects of European integration. European countries in general may have certain characteristics in common irrespective of European integration. To account for this possibility it is especially important to distinguish the effects of regional integration from those of trade policy in general. Hence, we introduced a variable that would capture real exchange rate distortions. Also, various specification tests seem warranted in a context when one cannot rely on a specific and well established theoretical model as a clear guide in the formulation of the empirical model. Obviously, this problem is exacerbated by the need to rely heavily on proxy variables.

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[7]de Melo, Montenegro and Panagariya (1992) test for long-run growth effects of RI by fitting a simple growth equation to a cross-section of 101 countries using the Summers-Heston (1988) data base. The data are divided into two groups: OECD and developing countries. The effect of RI is captured by the inclusion of a dummy variable. As control variables they use initial GDP per capita, a measure of the stock of human capital and the rate of investment. The model is estimated over the period 1960–85 and the subperiods 1960–72 and 1973–85. With one exception, Southern African Customs Union 1960–72, none of the integration dummies proved to be significant.

As a further extension, we explicitly introduce investment and inflation equations, in an attempt to examine if there is an indirect effect of integration by affecting investment ratios as suggested by Baldwin (1989), and if the macroeconomic policies undertaken in the EC have had a positive effect on growth. In the econometric specifications where we control for a large number of factors, the only mechanism left that could affect growth from European integration is technological transmission. However, there may be important indirect effects of integration, notably that it may spur investment and contribute to macroeconomic stability. Finally, it may be argued that investment and human capital could have different effects on growth after European integration. It has, for example, been proposed that under regional integration, a given investment ratio could result in a higher growth rate.[8] To take account of this possibility we allow the investment variable to interact with the integration dummy.

3.2 Data and Base Regression

We start out by running the following base regression:

$$GROWTH = \alpha + \beta_1 Y_0 + \beta_2 SCHOOL + \beta_3 INV + \beta_4 ECEFTA + \beta_5 RERD \qquad (1)$$

where *GROWTH* denotes average growth rate of real gross domestic product per capita, Y_0 is initial real GDP per capita to control for the level of development, *SCHOOL* is mean years of schooling in 1980 to control for human capital, *INV* is investment as a share of gross domestic product. *ECEFTA* is a dummy variable equalling 1 if the country is either an EC or EFTA member and 0 if it is not a member state. Lastly, *RERD* is a measure of the real exchange rate distortion to control for trade policy. The data source for *GDPG*, Y_0 and *INV* is Summers and Heston (1988). *SCHOOL* is taken from Barro (1991) and *RERD* from Dollar (1992).

The reasons for including Y_0, *INV* and *SCHOOL* are self-evident; they are by now widely recognised as the conventional new growth theory variables

[8]See the discussion in Kokko (1994).

(Fischer, 1991).[9] Since we are interested in the effect of regional integration on growth, our variable of interest is *ECEFTA*. Our last explanatory variable is *RERD*. This variable is the ratio of actual to expected price levels, and it is meant to capture the degree of trade protection; a high ratio implies more trade barriers and vice versa. The expected sign is negative, i.e., the higher the trade barriers, *ceteris paribus*, the lower the expected growth rate.[10] Thus, *RERD* captures the effects of trade policy in general, and enables us to distinguish growth effects attributable to regional integration as opposed to general trade effects.[11]

Our OLS regression results are presented in *Table 1* column (i). All variables have the expected sign and are significant at the 5% level. In particular, *ECEFTA* is positively related to growth and significant at the 5% level. Hence, the results from the base regression suggest that membership in the EC or in the EFTA is growth-promoting. However, since the model used in the base regression is not the only possible specification and since there are a variety of possible econometric problems, we will undertake a sensitivity analysis.

As a first modification of the base regression it may be of interest to examine whether the growth-promoting effect of RI differs between EC and EFTA members. Therefore, we add a dummy-variable for EFTA membership. The results from this regression are reported in column (ii). The dummy variable is insignificant, suggesting that there are no important differences between EC and EFTA membership on economic growth.

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[9]Levine and Renelt (1992) also include population growth as a control variable in their base regression. So did we in preliminary regressions, but this variable was dropped, since it was not significantly different from zero, and its inclusion did not affect the other coefficients.

[10]The importance of openness and trade regimes for economic performance has been confirmed in a great number of studies, e.g., Greenaway and Nam (1988), Greenaway and Sapsford (1994) and Edwards (1992).

[11]Real exchange rate distortion is the only trade policy variable that is always significant at least at the 10% level in Levine and Renelt (1992), whereas all other trade variables customarily used in the literature often become insignificant when the set of control variables is modified.

Table 1 Regression Results of the Base Regression (Dependent Variable: Growth of Real GDP per Capita).

Independent Variables	(i)	(ii)
Constant	0.804	0.825
	(0.91)	(0.93)
Y_0	–0.0004	–0.0004
	(–4.35)	(–4.37)
SCHOOL	0.189	0.189
	(1.92)	(1.92)
INV	0.176	0.175
	(4.74)	(4.68)
RERD	–0.0245	–0.0246
	(–4.69)	(–4.69)
ECEFTA	1.252	1.142
	(2.47)	(2.11)
EFTA		0.2659
		(0.54)
$\bar{R}^2$	0.35	0.35
No. of obs.	115	115

Note: Parentheses ( ) give White's (1980) heteroscedasticity-consistent *t*-statistics.

3.3 Sensitivity Analysis

Objections to our base results may arise due to omitted variables, non-normality of the error term, and measurement errors.

Given that there are a variety of theoretical links suggested in the literature and that not all of them can be included simultaneously, it is important to ensure that the estimated coefficients are not biased due to misspecification. Therefore, we have performed the Hausman test for contemporaneous correlation between the error term and the explanatory variables. It may be used to check for measurement errors and omitted variables. As instruments we have used energy consumption per capita,[12] secondary school enrolment in 1970, nominal GDP per capita in 1976,[13] and degree of socialism as measured by Scully and Slottje (1988). The null

[12]Data taken from *World Development Report*, various issues.
[13]Data for both variables are from *World Tables*.

hypothesis of no contemporaneous correlation cannot be rejected at the 5% level, suggesting that omitted variables and measurement errors need not be important problems.

The second potential problem is non-normality of the error term, which may give rise to misleading inferences from OLS regressions. We have therefore tested for normality of the error terms by performing a joint test for skewness and kurtosis as suggested by Shapiro and Wilk (1965). It turns out that the hypothesis of normality cannot be rejected at the 5% level.

A third, and perhaps the most important, objection could be that measurement errors in the other independent variables can affect the true coefficient for *ECEFTA*. Even though we cannot expect a measurement error in the *ECEFTA* variable, errors of measurement in the other variables may lead to biased estimates for the ECEFTA coefficient as well. Although the Hausman test is a crude test for measurement errors, further examination of this issue should be informative. We can do this by running reverse regressions.[14]

It has been shown by Klepper and Leamer (1984) that the bounds of the true maximum likelihood estimates can be obtained by performing reverse regressions on all variables that are expected to be measured with error. *Table 2* presents the results of these reverse regressions. Reverse regressions are performed by using all the independent variables expected to be measured with error as dependent variables. We have then solved each equation for the implied coefficients of the independent variables.[15] If there are no changes in sign when estimating the reverse regressions, this suggests that the estimates are robust to measurement errors.

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[14]Unbiased estimates in the presence of measurement errors can also be obtained by using instrumental variables. In doing so, the coefficient for *ECEFTA* increases somewhat compared to the base regressions, but the standard errors also increase (as expected). The results, which are available upon request, therefore suggest that measurement errors are not the cause of the positive *ECEFTA* coefficient.

[15]Consider the regression:

$GROWTH = \alpha + \beta_1 Y_0 + \beta_2 SCHOOL + \beta_3 INV + \beta_4 ECEFTA + \beta_5 RERD$; where we assume that *INV* is measured with error. Then, we estimate

$INV = \eta + \delta_1 Y_0 + \delta_2 SCHOOL + \delta_3 ECEFTA + \delta_4 RERD + \delta_5 GROWTH$ and solve for the implied coefficients equal to:

$$GROWTH = -\frac{\eta}{\delta_5} - \frac{\delta_1}{\delta_5} Y_0 - \frac{\delta_2}{\delta_5} SCHOOL - \frac{\delta_3}{\delta_5} ECEFTA - \frac{\delta_4}{\delta_5} RERD + \frac{1}{\delta_5} INV .$$

Table 2 Results of the Direct and Reverse Regression Analyses.

	Direction of minimisation				
	GDPG	Y_0	*SCHOOL*	*INV*	*RERD*
Y_0	–0.0004	–0.0046	–0.006	–0.0012	–0.0003
SCHOOL	0.18	2.43	8.76	–0.17	–0.68
INV	0.18	0.066	–0.16	0.845	0.216
RERD	–0.024	–0.043	0.088	–0.03	–0.17
ECEFTA	1.25	9.36	–8.63	2.28	4.12

If we assume that all variables are measured with error, we should be careful when making inferences from the data material since the true maximum likelihood coefficients do not necessarily lie in the same orthant as the coefficient from the direct regression. However, if we make the (unlikely) assumption that *SCHOOL* captures the effect of human capital without error, three of the variables will always have the same sign since the third column of the table can then be disregarded. In particular, the *ECEFTA* coefficient would, as in the direct regression, always be positive. Moreover, the fact that the coefficients change signs in the reverse regressions does not necessarily mean that the inferences are not permissible.

The method of reverse regression allows for R^2 to increase to 1 if the variables can be measured correctly. If we are willing to make an assumption regarding to what extent R^2 would increase by removing the measurement errors, we can also obtain bounds on the estimates.

The following formula yields the value of the coefficient of determination when measurement errors are removed:

$$R_m^2 = R^2 + (1-R^2)\left(\min_{ij} \frac{1}{1-B_{ij}/b_j}\right) \tag{2}$$

where b_j is the estimate of variable j from the direct regression, and B_{ij} is the coefficient of variable j that carries the highest magnitude of the opposite sign to b_j. The minimum is obtained when the ratio of B_{ij}/b_j is

the largest negative number; R_m^2 is the highest value that the coefficient of determination could take if error-free explanatory variables were used. If this R^2 with error-free explanatory variables is allowed to be much higher than the R^2 in the direct estimation, it is more likely that the data set is useful for deriving interesting conclusions. The R^2 in the direct regression is 0.35. By the use of formula (5), we can obtain R_m^2 for the *ECEFTA*-variable as 0.43. Thus, if when removing the measurement errors, the R^2 could not increase to more than 0.43, the *ECEFTA* coefficient would be bounded. In this case, since the proxy-variables are of fairly good quality, it seems rather optimistic to assume that R^2 would increase to more than 0.43 by the mere elimination of measurement errors. Hence, we are on reasonably firm ground if we conjecture that the maximum likelihood estimate of the *ECEFTA* parameter is positive.

3.4 Extensions

In the previous section, we examined various potential econometric problems. Although the omitted variables version of the Hausman test provides some guidance on the selection of other control variables, it is by all means not sufficient for dealing with this issue. We will therefore examine additional determinants of growth shown to be significant in previous tests. Moreover, this section also analyses possible channels, in addition to technological transfer, through which the effect of European integration may carry over to economic growth.

Macroeconomic variables may be potential candidates for such a purpose. In particular, Fischer (1991) argues that the effect of macroeconomic variables on long-term growth occurs through two routes. Macroeconomic management is likely to affect the rate of capital accumulation. More specifically, large budget deficits may induce capital flight. Furthermore, macroeconomic factors may affect the efficiency of resource utilisation, e.g. by distorting price signals so that the rate of return to investment or the real wage level are reduced. For our purposes we justify the inclusion of macroeconomic variables in two ways. First, to control for the effect of macro policies in different countries so that the variable *ECEFTA* does not capture possible similarities of macroeconomic policies in the member countries. Second, and more importantly, we

argue that European integration, on its own account, may have affected macroeconomic variables in the member countries.

We include three macroeconomic variables. *SURPLUS,* which is the ratio of government surplus to GDP. The expected sign of this variable is positive. The second variable, *INFL*, measures the average rate of inflation over the 1975–86 period. The expected sign for this variable is negative.

Although somewhat sensitive to changes in the set of control variables, government expenditures have in many cases proven to be negatively related to growth, e.g., Barro (1991) and Levine and Renelt (1992). The third additional variable is therefore *GOV,* the government share of expenditure in GDP. The data source for all three variables is *World Tables 1993.*

To begin with, we include the three variables separately. This is followed by the inclusion of all three variables in the regression to examine how the results are affected. In particular, we analyse how the inclusion of these variables affects our principal variable of interest, *ECEFTA*. The results are presented in *Table 3.*

The results reported in *Table 3* show that when we include *GOV*, column (i), our base regression results are upheld. *ECEFTA* is still significant at the 5% level, and the variable *GOV* is significant even at the 1% level. In column (ii) we instead include *SURPLUS*. Once again the results of our base regression are upheld: *ECEFTA* is still significant at the 5% level, and *SURPLUS* is highly significant. However, in column (iii) where we include *INFL* among the regressors, the *ECEFTA* coefficient is no longer significant and it is reduced from 1.1 to less than 0.7. This is also the case when inflation is introduced together with the other two variables *GOV* and *SURPLUS*, which suggests that the *ECEFTA* variable to some degree may capture lower inflation rates in Europe.

Table 3 Regression Results for Extended Growth Equations.

Independent variable	(i)	(ii)	(iii)	(iv)
Constant	0.802	0.925	0.082	1.051
	(0.78)	(0.92)	(0.94)	(1.08)
Y_0	–0.0004	–0.0004	–0.0004	–0.0004
	(–4.26)	(–4.47)	(–2.18)	(–2.01)
SCHOOL	0.207	0.202	0.185	0.204
	(2.05)	(2.05)	(1.14)	(1.09)
INV	0.159	0.162	0.185	0.162
	(3.56)	(3.73)	(4.93)	(3.67)
RERD	–0.0225	–0.0224	–0.024	–0.021
	(–2.49)	(–3.29)	(–4.59)	(–3.22)
ECEFTA	1.121	1.164	0.682	0.624
	(2.49)	(2.49)	(1.37)	(1.31)
GOV	–0.022			–0.030
	(–4.91)			(–2.12)
SURPLUS		0.088		0.032
		(9.71)		(0.72)
INFL			–0.016	–0.024
			(–4.29)	(–2.63)
$\bar{R}^2$	0.31	0.31	0.40	0.34
No. of obs.	88	94	104	83

Note: Parentheses ( ) give White's (1980) heteroscedasticity-consistent *t*-statistics.

One possible interpretation is therefore that although the direct effects of European integration may not be significant in all model specifications, there may be important indirect effects. We therefore attempt to examine this issue more thoroughly. More specifically, we analyse whether European integration has affected inflation rates and investment ratios. It is not easy to specify these equations. However, we follow Barro (1991) in specifying the investment equation and Magee, Brock and Young (1989) in specifying the inflation equation.

The inflation equation is the more difficult one to formulate. Since, we are not attempting to formulate a macroeconomic model, we have therefore chosen not to include macroeconomic variables such as money supply. Rather, we want to allow for politico-economic factors to affect the inflation rate. Magee *et al.* primarily focus on factor endowments, arguing that different factors will have different preferred rates of inflation. The variables capturing initial GDP and mean years of schooling are likely to capture the total endowment of total capital and

human capital endowment, respectively, in a reasonable manner. Moreover, we allow trade policy to affect the rate of inflation since the results in Magee *et al.* suggest that "openness" is negatively related to the inflation rate.

Table 4 Regression Results for the Investment and Inflation Equations.

	Investment	Inflation
Constant	12.520	1.238
	(4.73)	(0.10)
Y_0	0.0011	–0.0022
	(3.03)	(–1.25)
SCHOOL	0.541	5.061
	(1.48)	(1.91)
RERD	0.0085	0.137
	(0.55)	(1.26)
INV		–0.551
		(–0.98)
ECEFTA	–1.533	–16.961
	(–0.72)	(–1.60)
$\overline{R}^2$	0.30	0.014
No. of obs.	115	104

Note: Parentheses ( ) give heteroscedasticity-consistent *t*-statistics.

The results presented in the first column suggest that EC/EFTA membership has not led to higher investment ratios. Thus, we find no evidence of static gains leading to medium-run growth rates through investment increments as suggested by Baldwin (1992). However, a generous interpretation of the results suggest that EC membership may have had some effect on the rate of inflation. It may be argued that this provides one additional link through which European integration has been growth-promoting. On the other hand, the level of significance and the overall fit are quite low.

The use of separate inflation and investment equations introduces another potential econometric complication, namely that the error terms in the investment, inflation and growth equations can be correlated. If that is the case, the OLS estimates will be inconsistent. Although the

system of equations is recursive, we tested for correlation between the error terms in the equations using the Lagrange Multiplier method, introduced by Breusch and Pagan (1980). However, the null hypothesis of no correlation cannot be rejected at the 5% level, suggesting that OLS should yield consistent results.

A further consideration of the growth effect of RI is whether large and small countries are affected differently. Drèze (1961, 1989) has argued that small countries should benefit more from RI than larger ones, since they are likely to be able to reap relatively larger benefits from scale economies. However, Grossman and Helpman (1991, Ch. 9) show theoretically that economic integration of two countries of different size may be more beneficial for the larger country when knowledge spillovers are partly national in scope.[16] Thus, theory is inconclusive, and the issue has to be resolved empirically. We test for the existence of a large/small country EC/EFTA effect by introducing the variable *SMALL* equalling 1 for all countries but Germany, France, Italy and the UK. The results presented in column (i) of *Table 5* suggest that there are no significant differences between the effects of integration on growth in large and small countries.

In any case, the results thus far suggest that technology transfer is the main mechanism through which EC and EFTA membership affect growth. However, it may also be that the implicit assumption made so far, namely that the effect of investment on growth is equal for member and non-member countries, need not be true. For instance, in the policy-debate preceding the Nordic countries' accession to the EU, it was argued that a given investment ratio may have a larger growth effect in the case of EU-membership, since the social returns to investments would increase (see Kokko (1994) for a somewhat critical discussion). Therefore, we will examine whether the effect of investment differs between member and non-member countries. The results are presented in column (ii) of *Table 5*. They do not suggest that countries in the EC or EFTA should enjoy larger growth effects from a given investment ratio. In fact, the interactive variable is even negative although insignificant. Note also that

[16]A related matter is raised by the recent literature on increasing returns and economic geography (e.g., Krugman, 1991), where integration of two countries of similar structure but different size may induce firms to progressively locate in the larger country due to increasing returns to scale.

the direct effect of EC/EFTA membership on growth is still positive and significant.

Table 5 Additional Regression Results (Dependent Variable: Growth in Real GDP per Capita).

Independent Variables	(i)	(ii)
Constant	0.7969	0.7166
	(0.90)	(0.78)
Y_0	0.0005	–0.0005
	(–4.34)	(–4.39)
SCHOOL	0.1899	0.1868
	(1.91)	(1.89)
INV	0.1759	0.1806
	(4.74)	(4.64)
RERD	–0.2440	–0.0243
	(–4.67)	(–4.669
ECEFTAINV		–0.0856
		(–1.35)
ECEFTA	1.3451	1.1425
	(2.62)	(2.11)
SMALL	–0.1197	
	(–0.31)	
Observations	115	115
$\overline{R}^2$	0.34	0.35

Note: Parentheses ( ) give heteroscedasticity-consistent *t*-statistics.

4. Concluding Remarks

We have studied the effects of European integration on economic growth during the period 1976–85. In so doing, we have allowed for a large number of variables to affect growth to ensure that we are able to isolate the effects of integration and not simply capture other effects. In most specifications, the dummy variable for EC and EFTA membership was positive and statistically significant. In those cases, the size of the coefficient indicates that EC/EFTA membership may affect growth rates by around one percentage point. However, it did not seem to have mattered whether a country was an EC or an EFTA member.

However, it should be emphasised that the results seem somewhat sensitive. The coefficient capturing European integration is only significant in combination with certain control variables and not in combination with others. Unfortunately, there is no clear-cut theoretical guidance as to which variables should be included in the econometric model and it is therefore difficult to determine conclusively whether European integration does affect long-run growth. Moreover, the estimates do not seem to be fully robust to measurement errors.

The main conclusions should therefore be that the regional integration in Europe *may* affect not only static efficiency but *can* also have economically and statistically significant growth effects. However, it is hard to draw unambiguous conclusions about the future from this study, but it would seem to suggest that regional integration can be growth-enhancing in the long run.

This study may serve as a point of departure for further theoretical and empirical work. We have analysed potential econometric problems that our empirical model may encounter, and employed state-of-the-art methods for identifying and trying to correct for them. There seems to be no problems caused by omitted variables and normality of the error terms, but as far as measurement errors are concerned, the evidence is mixed.

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