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. 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. This conclusion is strengthened by the fact that we obtain similar results when we use panel data for a sample of OECD countries. A number of tests are also conducted to ascertain that the EC/EFTA variable is not primarily a proxy for the effect of economic development. 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.

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).

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 empirical analysis is conducted on a cross-section of a full sample of countries, a cross-section limited to rich countries as well as a panel of OECD countries.

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. In a full cross section of countries the estimated effect of EC/EFTA membership is implausibly high. This is probably due to the EC/EFTA variable capturing other growth-promoting features of developed countries. In a sample restricted to OECD members the estimated effect is still significantly positive, but smaller than in the full sample. In the full sample with public finances or possible threshold effects controlled for, again the estimated coefficient is of a more plausible magnitude. Thus, the basic conclusion is that there is a fairly robust association between European integration and growth. The growth effect is on the order of 0.6–0.8 percentage points p.a.

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. 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) 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.[2]

A further and far more substantive step is the theoretical developments that have made it possible to identify mechanisms through 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."[3]

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.

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[2]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.

[3]This is of course in line with the conclusions derived 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).

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 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.[4] 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 an integrated market the firm loses the option to choose between innovation and no innovation (Baldwin, 1993).

It must be noted that although these theoretical models identify potential growth-promoting mechanisms that result from increased economic integration, there is one important aspect that is left out: One would expect the effect of RI on growth to be influenced by the policy pursued by the integrated countries towards the rest of the world. This counteracting effect

[4]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 (1996).

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.

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 through which RI may permanently increase the rate of growth.

3. Testing the Long-Run Growth Effect

3.1 General Considerations

A large number of studies have examined the effects of global (as opposed to regional) integration on economic growth. Most of them are cross-country growth regressions, but recently there has also been studies using time-series data. In the cross-country growth regressions, a variable for trade has normally been added to a regression equation that also includes measures of investment and human capital formation. Therefore, trade policy can only affect growth through improvement in technology. Some indications of such improvements are available. However, the results are generally not robust to changes in the set of control variables, the partial exception being the variable real exchange rate distortions (*RERD*) originally constructed by Dollar (1992) – see Levine and Renelt (1992).

Attempts have also been made to capture regional integration in cross-country growth regressions. 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. Therefore, they are unable to capture potential investment effects of regional integration, effects that, given the results of general integration in Levine and Renelt, may be important. Furthermore, de Melo *et al.* control for investment in their equation and do not include an investment equation.

Recently, there have also been studies using time-series data and cointegration analysis. The results in Coe and Moghadam (1993) suggest that 0.3 percentage points of the French growth rate in the 1980s could be ascribed to the EU membership. Baldwin and Seghezza (1996) build on the seminal work by Coe and Helpman (1995) in examining regional integration. Coe and Helpman, using panel data of the OECD countries, find, among other things, that foreign R&D increases domestic TFP. Baldwin and Seghezza allow the effect of foreign R&D to differ between members and non-members in the EU, and find indications of the EU countries benefiting more from R&D expenditures. However, they do not find evidence of investment being positively affected to a larger degree than expected from the tariff-reducing effects of the EU. Given the results from these recent studies it is all the more surprising that de Melo *et al.* found no long-run growth effects of RI. On the other hand, it should be kept in mind that they only control for investment and initial income, and they perform no sensitivity analyses. Our own tests below will be mostly cross-sectional, but as a further check of the robustness of the results we have also included an analysis using panel data for the OECD countries.

In our view, 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. 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. The final year of our study is 1985. A further rationale for focusing solely on the post-integration period is given by the results in Ben-David (1993, 1994). He finds that there is strong income convergence within groups of countries that liberalized trade. With regard to the EC/EFTA countries, Ben-David's findings indicate that this convergence process may be completed or near completion by the mid 1970s.

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. By doing so we hope to be able to reconcile the contradictory findings in previous studies. 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. The application of a number of specification tests is necessary to alleviate a number of by now well-known weaknesses with so-called Barro equations (Levine and Renelt, 1992).

As a further extension, we explicitly introduce investment and inflation equations, in an attempt to examine if there is an indirect effect of integration 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, technological transmission is the only mechanism left by which European integration could affect growth. 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.[5] To take account of this possibility we allow the investment variable to interact with the integration dummy.

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

3.2 Data and Base Regression

We start out by running the following base regression:[6]

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

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 (Fischer, 1991).[7] 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.[8] 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.[9]

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[6]We are aware that, *inter alia*, Bernard and Durlauf (1996) and Quah (1996) have criticised the conventional findings of (conditional) convergence in so-called Barro-regressions of the type used in this paper. It is not clear to us how their critique applies to the present study, where convergence is not the prime issue.

[7]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.

[8]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).

[9]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.

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, the coefficient for *ECEFTA* is positive 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, in what follows we undertake a sensitivity analysis.

Table 1

Naturally, it is difficult to find a trade policy variable that perfectly controls for trade policy towards non-EC/EFTA countries, hence it is possible that *RERD* to some degree captures the effect of RI. There is therefore a possibility that the growth effect of EC/EFTA membership is somewhat underestimated. As a preliminary check for this possibility we regressed *RERD* on *ECEFTA*. The coefficient turned out to be negative and significant at the 1% level, but it should be emphasized that this result is suggestive rather than conclusive.

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 significant differences between EC and EFTA membership on economic growth.

3.3 Sensitivity Analysis

Objections to our base results may arise due to omitted variables, non-normality of the error term, and measurement errors. One could also object to our use of data from both developed and developing countries, and to the fact that we refrain from using panel data.

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. We use the Hausman test to check for measurement errors and omitted variables. As instruments we have used energy consumption per capita,[10] secondary school enrolment in 1970, nominal GDP per capita in 1976,[11] and degree of socialism as measured by Scully and Slottje (1988). The null hypothesis of no contemporaneous correlation could not be rejected at the 5% level, suggesting that omitted variables and measurement errors need not be important problems.

We have tested for normality of the error terms by performing a joint test for skewness and kurtosis as suggested by Shapiro and Wilk (1965). The hypothesis of normality could not 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*. 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.[12]

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 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.[13] 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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[10]Data taken from *World Development Report*, various issues.

[11]Data for both variables are from *World Tables*.

[12]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.

[13]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

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 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:

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

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 Does the EC/EFTA Variable Primarily Capture Economic Development?

One potentially important objection to our results remains. The EC/EFTA dummy may primarily capture developed country characteristics rather than effects of European integration. Clearly, most of the countries in our sample are not even near the development level of the European countries. The variable for initial GDP per capita should already have taken care of this problem. However, it may be that developed countries, i.e. countries above some threshold level of development, have some characteristics in common that are difficult to control for in growth regressions. Therefore, we have constructed two development dummies. They generally reflect the development levels of the OECD-countries, but they do not exclude other countries at similar development levels, and we include them instead of and together with the EC/EFTA dummy. The first dummy, *DEVEL1*, equals one for countries with a GDP per capita above USD 4000 and 0 otherwise, whereas *DEVEL2* draws the limit at USD 6000.

When *DEVEL1* is included instead of the EC/EFTA dummy in the base regression, its coefficient is insignificant and even negative. This is changed when we include *DEVEL2*. Then the coefficient is 2.61 with a *t*-statistic of 2.24, clearly indicating that countries above this income threshold grow faster than other countries.[14] Could it then be that the EC/EFTA dummy simply (imperfectly) captures the fact that the European countries are also highly developed? To explore this possibility we included the EC/EFTA dummy in addition to the two development dummies. As shown in *Table 3*, *DEVEL1* is insignificant whereas *DEVEL2* is positive and significant at the 1% level. In fact, the results suggest that being a highly developed country can, when other factors are controlled for, raise your growth rates by roughly 2 percentage points. Most interestingly for our purpose, however, the EC/EFTA dummy is still positive and significant at the 5% level. The results suggest that being part of the EC or EFTA raises the growth rate by

[14]Azariadis and Drazen (1990) construct a growth model with properties that are consistent with our findings in this respect. Their model has a threshold property permitting multiple stationary states. This is based on the existence of increasing social returns to scale in the accumulation of human capital, which becomes particularly pronounced when economic state variables attain critical mass values.

0.8 percentage points, a more plausible figure than the 1.25 percentage points we arrived at previously.

So, there seems to be effects from European integration that are not only attributed to high levels of development. In order to further examine whether the EC/EFTA dummy captures other effects than RI, we re-estimate equation (1) on a sample restricted to the OECD countries, and the coefficient for EC/EFTA membership is still positive and significant. The results now suggest that EC or EFTA raises growth rates by 1.0 percentage points (the *t*-statistic is now as high as 3.70). One should not draw overly strong conclusions from a regression with only 22 observations. Yet, it offers some complementary evidence that the EC/EFTA dummy is not primarily a proxy for the development level.

Table 3

Even more importantly, in *Table 4* we also present results, where pooled data have been used to obtain additional information.[15] Our data set (same data sources as above) is composed of 22 OECD countries, where we allow dummy variables to capture period-specific effects. There are four time periods: 1975–78, 1979–82, 1983–86 and 1987–90.

Table 4

We first estimated this model using OLS (not shown). The coefficient on the EC/EFTA variable is still significant at the 10% level, and the coefficient suggests that European integration increases the growth rate by roughly 0.4 percentage points. However, the Shapiro-Wilk (1965) joint test of skewness and normality shows that the H_0 of normality can be rejected even at the 1% level. Unlike OLS, so-called robust estimations do not assume normality of the error terms (Rousseeuw and Leroy, 1987). Robust regression results are presented in *Table 4*. The main conclusions from the OLS estimations are even somewhat strengthened. The point estimate is larger and the level of significance is substantially increased. The other variables all have the expected sign and are significant.[16]

[15]See also Torstensson (1996).

[16]Landau (1995) examines the effects of European integration in 1950–90 using panel data, but fails to find any positive growth effects when controlling for variables such as government debt, initial GDP per capita and changes in terms-of-trade. He does not,

The coefficient on the EC/EFTA variable is now smaller than in the cross-sectional analysis, suggesting a more plausible increase in growth rates of roughly 0.6 percentage points. This estimate is especially striking since the sample is restricted to OECD countries, where it is difficult to argue that the EC/EFTA variable simply captures omitted effects not captured by the initial income variable.

To sum up, the possibility that the EC/EFTA dummy primarily proxies for the effect of economic development has been submitted to a number of tests. Despite the inclusion of initial income, income threshold variables, and the exclusion of all non-OECD countries from the sample, the EC/EFTA dummy remains significant, indicating a growth bonus in the range of 0.6–0.8 percentage points of RI in Europe.

3.5 Extensions

In section 3.3 we examined various potential econometric problems and in section 3.4 we tried to ascertain that the EC/EFTA variable did not primarily proxy for the effect of economic development. In this section we inquire whether the EC/EFTA variable captures effects of variables not included in the analysis so far. 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.

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however, attempt to control for some of the most common growth variables, nor does he control for trade policy in general. Moreover, it beats us how one can hypothesize that European integration had a positive effect on growth in the 1950s.

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 5*.

The results reported in *Table 5* 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 5

To sum up, we have found a fair bit of empirical evidence suggesting that EC/EFTA membership affects growth rates positively. However, they are not completely robust to changes in the set of control variables and are thus, strictly speaking, somewhat fragile according to the Levine-Renelt criterion. On the other hand, this criterion is exceedingly strong, and failure to fulfil it entirely only suggests that one should avoid drawing too strong conclusions.

In addition to the potential growth effect through technical progress, there may also be indirect effects of European integration that affect variables that we controlled for in the growth regressions. In particular, there are theoretical arguments and previous empirical results suggesting that integration may affect growth through increased investment. It could also be that integration has affected inflation rates.

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 capital and human capital, 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.

The results presented in the first column of *Table 6* 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.

We used *RERD* to control for general trade policy as opposed to regional integration. In previous studies, a positive relationship has been found between other trade variables and investment rates. For the period 1960–89, Levine and Renelt even find a robust positive relationship between trade as a share of GDP and investment rates. Clearly, if this is the case and if European integration has contributed to increased openness, this provides a possible link between such integration and growth. Furthermore, if this variable is a more appropriate trade policy variable, the *ECEFTA* coefficient may also change. However, the openness variable is not significant in this sample, nor does the inclusion of this variable as the trade variable change the coefficient for EC/EFTA membership; it is still insignificant with a very low *t*-statistic. This does not rule out that in previous periods, there have been investment-led growth effects of European integration, but in this period there is no evidence of such an effect.

Table 6

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 could not be rejected at the 5% level, suggesting that inferences from the OLS estimate are consistent.

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.[17] 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 examine whether the effect of investment differs between member and non-member countries. The results are presented in column (ii) of *Table 7*. 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 the direct effect of EC/EFTA membership on growth is still positive and significant.

Table 7

[17]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.

4. Concluding Remarks

In this paper we have studied the effects of European integration on economic growth. In so doing, we allowed for a large number of variables to affect growth to ensure that we were able to isolate the effects of integration and not simply capture other omitted effects. In most specifications, the dummy variable for EC and EFTA membership was positive and statistically significant. The size of the coefficient indicates that EC/EFTA membership may increase growth rates by around 0.6–0.8 percentage points. However, it did not seem to have mattered whether a country was an EC or an EFTA member. Our main cross-sectional results are supported by similar results when we use panel data for a sample of OECD countries. The results also suggest that technology transfer is the main mechanism through which EC and EFTA membership affect growth; we find no effect of EC/EFTA membership on investment.

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. Furthermore, we have tried to ascertain that the EC/EFTA variable did not primarily proxy for the effect of economic development.

The main conclusions should therefore be that the regional integration in Europe not only affects static efficiency but can also have economically and statistically significant growth effects. It is hard to draw unambiguous conclusions about the future from this study, but it suggests that the further regional integration through the launching of the internal market programme can be growth-enhancing in the long run. A natural extension of the present paper would be to look at a panel that went back to the pre-integration period in order to more fully capture the time-series performance of the integrated countries.

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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)
$\overline{R}^2$	0.35	0.35
No. of obs.	115	115

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

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

Table 3 Regression Results Including Income Threshold Variables (Dependent Variable: Growth of Real GDP per Capita).

Independent Variables	(i)
Constant	1.35
	(1.92)
Y_0	–0.0006
	(–3.43)
SCHOOL	0.167
	(1.70)
INV	0.191
	(5.05)
RERD	–0.027
	(–5.18)
ECEFTA	0.840
	(2.04)
DEVEL1	–0.829
	(–0.75)
DEVEL2	2.161
	(2.03)
$\overline{R}^2$	0.30
No. of obs.	115

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

Table 4 Robust Regression Results Using Panel Data for 22 OECD Countries (Dependent Variable: Growth of Real GDP per Capita).

Independent Variables	(i)
Constant	1.422
	(1.87)
Y_0	–0.0001
	(–2.22)
SCHOOL	0.202
	(2.77)
INV	0.073
	(2.92)
RERD	–0.008
	(–1.27)
ECEFTA	0.587
	(2.56)
Dummy 79–82	–2.092
	(–3.32)
Dummy 83–86	–1.463
	(–2.25)
Dummy 87–90	–1.656
	(–2.48)
$\overline{R}^2$	0.22
No. of obs.	88

Note: Y_0 = income at the beginning of each subperiod. *INV* and Growth rate of GDP per capita are averages for the respective subperiods. *SCHOOL* is defined as mean years of schooling in 1980 for the first two subperiods and as mean years of schooling in 1985 for the last two subperiods. Parentheses ( ) give White's (1980) heteroscedasticity-consistent *t*-statistics.

Table 5 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)
$\overline{R}^2$	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.

Table 6 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.

Table 7 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	–0.0244	–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)	
No. of obs.	115	115
$\overline{R}^2$	0.34	0.35

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