EU accession and income growth:

an empirical approach

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Abstract

The dynamic gains from EU membership are crucial for the new member states to catch up with the average income level in the old member states. To gauge the dynamic effects we follow a two-step procedure in which a gravity equation for bilateral trade shows the trade effect of EU membership and a growth regression yields the income effect of trade. Shared EU membership is found to increases trade between two of its member states with at least 33%. The trade effect of membership implies an income increase between 18% and 26%. EU membership may contribute to growth by facilitating trade but also by inducing countries to improve the quality of their institutions. Indirectly, through higher trade, and directly a better quality translates into a higher income. The institution effect of membership is an income increase between 13% and 17%. The overall effect of EU membership is therefore estimated to lie between 31% and 43%. This implies that EU membership, or its effect on trade and institutions, could lead to large economic gains for the new member states, but does not bring them economically with the old member states.

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1 Introduction

In May 2004 eight countries from Central and Eastern Europe (CEE), along with Cyprus and Malta, joined the European Union. This was the largest expansion in the history of the European Union, and reunited a continent that was split for almost half a century by the Iron Curtain. For the eight countries this marked their transition from a centrally planned economy and a one-party system towards a market economy and a democratic structure. The enthusiasm in these countries was large – in referendums voters approved entry by large margins –, fuelled not only by political reasons but also by economic expectations.

Many in the new member states, and also in the candidate countries Bulgaria, Rumania and Turkey, hope that EU membership will pave the way towards economic prosperity. In 2001 income per capita in the ten new member states was about 45% of the EU-15 average (measured in purchasing power terms). For the three candidate countries the gap with the EU average is even larger. The income gap is larger than it was with earlier entrants, like Ireland, Portugal and Spain. More importantly, from the perspective of the new member states and the candidate countries, these earlier entrants have fared pretty well after their accession. Production per capita in Ireland is now one of the highest in European Union. Measured in purchasing power terms, Spain has also increased its production per capita from 74% in 1986 to 84% in 2001 of the EU-15 average, and Portugal has increased it from 62% to 75% in the same period.

The enthusiasm in the new and candidate member states is not fully shared in the old member states. Political considerations have largely driven the process of shifting the Union's border to the East. The income differences, however, give rise to several concerns. The first is that the income differences translate into different political priorities. The increased heterogeneity may hinder policy making at the European level. For example, for the new and candidate member states could very well be less interested in pursuing climate change policies than the old member states. Second, the income differences may also give rise to (large) migration flows from new to the old member states. Third, the large income differences exert an upward pressure on the EU budget and give new impetus to discussions about the allocation of funds across member states. Of course, these concerns depend on the economic performance of the new member states after their accession. The concerns will become less when (the prospect of) accession proves to be the starting point for fast catching-up toward the average income in the EU-15.

The EU countries – both new and old – thus hope for economic prosperity in the new member states. The central, important question is whether European integration does indeed stimulate catching up of the new member states and will indeed reduce the income differences.

The economic literature does not deliver a clear-cut answer. The studies fall roughly into two categories. The studies in the first category derive from simulations the gains of the economic

integration of EU membership. Typically, the gains are static. The studies in the second category use regression analysis to gauge the overall effect of EU membership on income (growth). Table 1.1 presents the results from studies in the first category. Models are simulated to calculate the effects of removing trade barriers between the national goods and services markets. Some of the studies only take account of (the elimination of) the trade taxes between countries. Other studies also consider a decrease in non-tariff barriers following from joining the internal market. This decrease in real trade costs follows from, among other things, abolition of administrative barriers (i.e. no waiting time at borders, less formalities, etc.) and elimination of many technical barriers (through mutual recognition of technical standards, harmonization of rules and regulations, minimum requirements). Furthermore, risk and uncertainty will diminish since EU membership constrains arbitrary changes in trade policies (Baldwin et al. 1997), which will make decision making of economic agents easier. Table 1.1 gives the impression that more recent studies turn up with more pronounced effects. One reason might be that over time researchers find better ways to approximate non-tariff barriers. Breus (2001) and Lejour et al. (2004) predict an average income effect for Central and Eastern Europe that is more than 7% of GDP. Of course, this effect is notable. But clearly, it is not nearly enough to close the income gap between new and old member states. It implies that income in the accession countries rises from 45% to only 48% of the EU-15 average (Lejour and Nahuis, 2004). That model simulations do not predict full or significant convergence, follows from the focus on the static gains of trade. They overlook – for example – the effects of better integrated capital markets, larger FDI flows or the dynamic effects of integrated product markets. Also, international trade in goods and services may facilitate the transfer of ideas and technologies and in this way contribute to higher productivity (growth).[1]

Table 1.1 Static gains of EU enlargement on GDP with CGE models

	Effect on EU-15	Effect on CEE countries
Baldwin et al (1997)	0.2	1.5
Brown et al. (1997)	0.1	3.8
European Commission (2001)	0.2-0.4	n.a.
Lejour et al. (2004)	0.1	7.8
Breuss (2001)	0.2	7.2

The second category of papers uses regression analysis to directly estimate the effect of EU membership on economic growth. This does not confine the gains from membership to improvements in allocative efficiency, but rather considers the overall effect on production (growth). Henrekson et al. (1997) use panel data for 23 OECD countries and 5 time periods between 1970 and 1990 to establish the effect of EU and EFTA membership on economic growth per capita. They derive that EU membership raises economic growth for a long time by about 0.6% to 0.8% per year. The results are not always robust for alternative specifications of

[1] See for example Coe and Helpman (1995) and Griffith, Redding and Reenen (2000).

the regression. With a similar data set Vanhoudt (1998) did not find a permanent growth effect of EU accession. Badinger (2001) argues even that a large part of the trade integration does not follow from EU membership, but is the result of successful trade negotiations in the GATT and WTO.

Two studies also look into particular aspects of EU membership that may have an impact of economic growth. Crespo-Cuaresma et al. (2002) focus only on the EU countries. They come up with the result that the duration of EU membership has a positive effect on GDP growth per capita. Crafts and Kaser (2004) stress, on the other hand, the importance of the rule of law for the CEE countries and their economic performance. They include in a growth regression a measure for the rule of law. Crafts and Kaser conclude that economic growth per capita in the CEE countries (including Bulgaria and Rumania, excluding Cyprus and Malta) can be about 4% in the medium term, if they move to EU standards of good governance.[2]

In this paper we reconsider the effect on EU membership on economic growth, with a particular focus on the production gains of integrating national markets into the European internal market. We employ a two-step procedure, following Frankel and Rose (2002). First, an estimated gravity equation for bilateral trade yields that EU membership contributes to trade, mainly among the member states. Second, trade openness is estimated to contribute to production (growth), in line with the results of a vast empirical literature on the link between the two. The two-step procedure has the important advantage that it allows us to empirically identify the effect of EU membership. Changes in membership do not occur often. It is hardly surprising that a dummy for EU membership in the growth regression turns to be statistically insignificant. Instead, the procedure uses the variation across bilateral trade flows (the gravity equation) and uses the variation over time (the growth regression) to identify the link from EU membership via trade openness to production growth.

Institutional change is another important aspect of the EU integration. North (1990), for example, argues that institutions (in a broad sense) reduce uncertainty which in turn lowers transaction costs and contributes positively to economic performance. In all accession countries EU membership serves as an external anchor for institutional change (e.g. stronger protection of property rights). De Melo et al. (1992) talk about a tendency towards institutional convergence. Indeed, recent empirical literature strongly supports a positive link between the quality of institutions and economic growth.[3] Rodrik and Subramanian (2003) claim that institutions trump everything else in explaining growth. Empirical work also finds a strong relation between the institutional quality and trade flows.[4] De Groot et al. (2004) emphasize furthermore that

[2] Using a growth-accounting exercise they also show that these growth rates are only possible by sufficient TFP and capital growth. Given the projected population and labour force developments, and participation rates, labour growth will probably be negative in the coming decades.

[3] See for example Hall and Jones (1999), Knack and Keefer (1995), Acemoglu et al. (2003), Easterly and Levine (2003), Kaufman et al. (2003).

[4] See Koukhartchouk and Maurel (2003), de Groot et al. (2004), and Jansen and Nordas (2004). .

differences in institutional arrangements may hamper trade among countries. In view of this literature, measures for institutional quality are included in both steps. Introducing these measures reduces the effect of EU membership on trade flows and the effect of openness on growth, but does not annihilate these effects. So, there are two relevant channels through which the accession countries are likely to benefit from EU membership. First, joining the internal market increases their opportunities to trade and raises their growth potential. Second, improving their institutions to meet EU requirements has – directly and indirectly – a positive impact on their growth potential.

The empirical results support optimism of the CEECs. First, EU membership increases trade by 33% to 55% depending on the effects of institutional changes on the volume of trade. The effects for the individual CEE countries vary widely. To a large extent this variation depends on the openness of a country and its trade intensity with the EU, and with the quality of the institutions Second, a one percentage point increase in the trade/GDP ratio expands output by about 0.53% to 0.77% in the long run. Combining the two effects, the new EU members can experience on average an increase in their real income in range of 31% to 43% percent in the long term. These results show that EU integration could significantly help in reducing the income gap between new and old member states. Relative income in the accession countries could increase from 46% to even 65% of the EU-15 average. That is a significant decline of the income gap, although much remains to be done for closing it.

The rest of the paper is structured as follows. Section 2 provides estimations results for the relation between EU membership on openness. In Section 3 we quantify impacts of openness on income. In section 4 we combine the two regression results and estimate effect of accessing the EU on output for all the accession countries. Section 5 concludes.

2 Effects of the EU membership on bilateral trade

Economic explanations of bilateral trade flows found inspiration in Newton's physical laws of gravity. The gravity model for trade flows appeared in the early 1960s (Tinbergen, 1962), and its theoretical foundations were laid down only later on. Anderson (1979) and Bergstrand (1985) have shown that the model is compatible with the 'new' trade theory as well as with the Heckscher-Ohlin framework.

In the field of economics, the gravity model suggests that trade between two countries will increase with their size and decrease with distance between them. Bigger countries have a higher potential to export (supply) and import (demand) from their partners. The 'new' trade theory suggests that trade flow between two countries is higher the more the productivity levels in these countries approach each other. Distance is a proxy for transport costs: the larger the distance the higher the transport costs. The costs of international transactions may include more than just costs of international transport. Usually a set of dummies is included to proxy for other ways in which transaction costs may arise. Do countries share a common border? Do they have a common language? Do they take part in a same regional trade agreement? In explicit form the gravity equation is as follows

$$\log(X_{ij}) = \beta_0 + \beta_1 \log(Y_i) + \beta_2 \log(Y_j) + \beta_3 \log(\tfrac{Y_i}{N_i}) + \beta_4 \log(\tfrac{Y_j}{N_j}) + \delta_1 \log(D_{ij}) + \ldots + u_{ij}, \qquad (2.1)$$

where X_{ij} is the value of the flow from country i to country j expressed in constant U.S. dollars, Y_i (Y_j) is GDP in i (j) in constant US dollars, N_i (N_j) is the total population in i (j), D_{ij} is the distance between the two countries and u_{ij} is a normally distributed error term. To capture the idea that trade may be relatively intense between similar countries, GDP per capita of the two trading partners is included.

The equation may include any other factors that either aid or resist trade between i and j and have similar effect as distance. In particular, a dummy for shared membership is included to see what the effect of EU membership is. It is this dummy that is in the centre of our interest. By creating an internal market for goods, services and capital the European Union removes various explicit and implicit barriers to trade. The expectation is of course the trade more intense when the two trading partners are *both* EU member. Also included are dummies for membership of the APEC and the OECD (excluding the EU). Since the APEC is free trade area and the OECD not even that, one would expect shared EU membership to have a larger effect than shared membership of either APEC or the OECD. However, this outcome is not inevitable empirically. Rose finds that the membership of the OECD is associated with larger stimulus to trade than membership of the WTO.

Data and estimation

Data for bilateral trade flows are available for 160 countries in the period 1996-2000. Combining these with data for the control variables, yields at most 45712 observations. Missing an explicit price deflator for exports, the share of nominal exports in nominal GDP is taken as the dependent variable. The data sources are described in appendix B.

The gravity equation is estimated with weighted least squares, where (log) exports are used as weights. Weighing allows for the possibility that the thinner market is the higher variance becomes.

2.1 Estimation results

The regression equation explains over 50 percent of the variation in the data. The first column of Table 2.1 (equation 1) shows that the traditional factors – distance, GDP, and GDP per capita – are statistically significant and in line with the literature. Since exports are a fraction of GDP, the difference between the coefficient for GDP of the exporting country and for GDP of the importing country is largely cosmetic. The effects of GDPs per capita are about 0.5, showing that rich countries trade more than proportionally with each other. Finally, the estimate for (the log of) distance is near -0.82, indicating that 10 percent decrease in distance leads roughly to a 8.2 percent increase in bilateral trade. Using the same language appears to more than double trade. Sharing a border has a smaller but still an important effect.

The result of interest is, however, the coefficient of the dummy for shared EU membership. When the two trading partners are both EU member, trade between the two is higher than usual. The estimated coefficient, 0.52, implies that common membership leads to 50% extra trade between the two trading partners. Clearly, this is an important effect. This effect is comparable with earlier studies.[5]

Remarkable is, however, that shared membership of APEC has an even larger effect on trade. The European Union is much more than a free trade area. For example, it aims to abolish non-tariff, technical barriers through mutual recognition or harmonisation of product standards. However, the results do not indicate that relatively deep integration within the European boosts international trade more than relatively loose integration within free trade area like the APEC. The large effect of APEC membership is also found by Frank and Rose. The effect of OECD membership, excluding the EU members, is modest, however (equation 2).[6] In contrast to Rose's results, our regression has – reassuringly – the outcome that trade-promoting institutions indeed promote trade.

[5] Baldwin et al. (1997) as well as Brenton and Gros (1997) find an increase in bilateral trade between EU members of about 30%. Later studies find larger effects. Fidrmuc and Fidrmauc (2003) report a 40% increase in bilateral trade, and Lejour et al. (2004) a 50% increase.

[6] Since membership of the APEC and the OECD overlaps considerably, the two dummies are introduced separately into the equation.

Within European Union the quality of institution is high. For example, corruption does not occur at a large, government procedures are fairly transparent and the social-political conditions are stable. This level of quality is conducive to international trade. Alternatively, the prospect of EU membership may induce a country to improve its institutions. The accession countries have made numerous changes in their legal systems. In any case, one expects that EU membership and institutional quality are related, Indeed, columns three and four in Table 2.1 shows that including measures for governance reduces the effect of EU membership. In the specification with the dummy for the APEC membership, the coefficient for the EU dummy falls from 0.52 to 0.37 (column 1 versus column 3).

With the specification in (2.1) the European Union is assumed to have the same relative effect on the bilateral trade flows between its member states. A common idea is, however, that mainly small and open economies benefit from the European integration of national markets. They may see a more than average increase of their trade within the European Union. To allow for this possibility the cross-product of the dummy for shared EU membership and openness of the exporter is introduced (where openness is defined as the sum of export and imports as percentage of GDP). The coefficients in the fifth and sixth column imply that a small, open economy benefits more from European integration than a large, relatively closed economy. The average effect of shared EU membership is roughly the same as in the other regressions. Notable is, however, the difference between small and large member states. For Belgium with an openness of 140% the increase in its export is about 90%, whereas for Germany with an openness of about 50% it is 24%.

Table 2.1 The effect of the EU membership on bilateral trade flows

Regression	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-21.591	-22,797	-18,891	-19,807	-21,293	-19,084
	[-132 6]	[-135.9]	[-78.4]	[-78.0]	[-121.1]	[-757.1]
EU dummy	0.522	0.393	0.375	0.241	-0.050	-0.146
	[20.4]	[14.8]	[14.1]	[8.8]	[-1.0]	[-2.9]
EU * openness					0.005	0.005
					[9.9]	[9.3]
APEC	1.250		1.165		1.140	1.086
	[40.3]		[36.6]		[24.2]	[22.9]
APEC * openness					0.000	0.000
					[0.8]	[0.5]
OECD (excluding EU)		0.086		0.064		
		[2.2]		[1.5]		
log GDP exporter	-0.165	-0.136	-0.147	-0.117	-0.196	-0.184
	[-38.2]	[-30.0]	[-31.0]	[-23.6]	[-42.0]	[-36.1]
log GDP importer	0.776	0.807	0.794	0.826	0.794	0.811
	[172.3]	[177.0]	[166.1]	[171.0]	[169.4]	[163.5]
log GDP per capita exporter	0.500	0.510	0.402	0.400	0.531	0.489
	[58.6]	[58.0]	[32.8]	[30.9]	[60.5]	[40.0]
log GDP per capita importer	0.498	0.505	0.392	0.389	0.514	0.382
	[58.1]	[56.6]	[31.9]	[30.2]	[57.5]	[29.4]
log distance	-0.817	-0.818	-0.839	-0.843	-0.858	-0.866
	[-98.4]	[-95.6]	[-96.3]	[-93.3]	[-94.3]	[-92.0]
common border	0.592	0.579	0.588	0.578	0.383	0.392
	[17.1]	[16.2]	[16.6]	[15.9]	[9.8]	[1.0]
common language	0.848	0.932	0.750	0.821	0.769	0.685
	[36.2]	[40.0]	[30.4]	[33.5]	[32.6]	[27.8]
institutional quality exporter			-0.224	-0.248		-0.110
			[-14.6]	[-14.8]		[-7.1]
institutional quality importer			-0.242	-0.260		-0.294
			[-13.9]	[-13.8]		[-15.3]
Weighted R-squared	0.594	0.580	0.566	0.552	0.612	0.586
Observations	45712	45712	41676	41676	38040	35337

Dependent is log export as percentage of GDP of the exporting country

Heteroskedasticity robust standard errors are reported between square brackets. ***. ** and * indicate statistical significance at 1%. 5% and 10% level.

The sample spans the period 1996-2000. Year dummies are included but not reported.

3 Trade and income

This section concentrates on the effects on income. From a theoretical perspective there are good reasons to believe that the two are closely connected. With lower barriers to international trade producers and consumers gain better access to specialized products. Lower barriers may also foster international competition forcing firms to lower their mark-ups and to exploit returns to scale better. Finally. the endogenous growth theories usually emphasize that dynamic gains are associated with openness: via international exchange of goods and contacts with foreigners firms are able to tap new knowledge and ideas which help them to speed up their innovation process.

A bulk of recent research has supported positive link between openness and growth. A typical specification takes the growth rate or the income level as dependent. and a measure of openness together with other neoclassical growth variables as independent variables. There has been a lot of discussion on the measure of openness. The most widely used variable – which we will also use in our analysis – is the ratio of trade to GDP. In these regressions the openness variable is found to have a positive and significant effect on growth.[7]

However. the interpretation of the results is not straight forward in this line of research. Establishing the causality from trade to growth is troublesome. since it may run either way. To correct for simultaneity Frankel and Romer (1999) suggest to use geographic characteristics such as distance. common borders. common language. etc.. which are plausibly exogenous. in order to obtain instrumental variables estimates of the effect of trade on income. By doing so they find that trade has quantitatively large and robust positive effect on income. Irwin and Terviö (2000) support these findings for an extended sample period. We do not estimate with instrumental variables here. One of the reasons is that according to both studies using instruments for trade leads to higher coefficients than plain OLS. This suggests that OLS estimates are downward biased and our result provide a lower bound for the effect of trade on income.

3.1 Growth equation and openness

Following Mankiw. Romer. and Weil (1992) the classical Solow growth equation is estimated. The equation takes the following form:

$$\ln(\tfrac{Y}{Pop})_{it} = \alpha_0 + \alpha_1(\tfrac{X+M}{Y})_{it} + \alpha_2 \ln(Pop)_{it} + \alpha_3 H + \alpha_4(\tfrac{I}{Y})_{it} + \ldots + \beta \ln(\tfrac{Y}{Pop})_{i(t-1)} + u_{it} \qquad (3.1)$$

where the dependent variable is (the natural logarithm of) real GDP per capita. *X*. *M*. and *I* stand for exports. imports. and investments. and *H* is the total number of schooling years. intended to

[7] Good surveys of literature are Edwards (1993a) and Dollar (1992).

approximate investments in human capital. Openness is defined as the value of import and exports divided by GDP of a country.

We use a panel covering the period 1960-2000 whereby we divide it into eight five-year intervals. The variables are averaged over these intervals. The exception is initial income at the at the beginning of each five-year period. The random error term u_{it} is less influenced by business cycle fluctuations and less likely to be serially correlated than it would be with yearly data.

Including accumulation of productive factors. i.e. investment in human. investment in physical capital and population growth. as explanatory variables may bias the coefficient for openness downwards. A positive effect of openness on factor accumulation is not included in the openness coefficient α_1. We prefer this conservative approach.

The specification differs from Frankel and Rose (2002) in several respects. For example. the primary and secondary schooling rate is replaced by the number of schooling years. Given the underlying classification problems for primary and secondary schooling the number of schooling years is a better measure for human capital. Also. we have replaced GDP per capita at the beginning of the sample period with GDP per capita in the first year of every five-year period.

3.2 Impact of openness on income

The first column of table 3.1 gives the empirical outcomes of estimating equation (3.1). The other columns provide two extensions to our basic regression.

The traditional controls of the neoclassical growth model are with an exception of one – human capital – all statistically significant. The coefficient of total number of schooling years is not always indistinguishable from zero. This is also the case for the proxies of human capital in Frankel and Rose. This finding is reminiscent of a claim of Easterly (2001) that it is not education *per se* that contributes to economic growth but rather general knowledge that is acquired by people.

We focus on the coefficient of openness. As we have mentioned above. openness variable may affect accumulation. We are aware that induced factor accumulation will not be attributed to changes in openness. leading to a downward biased coefficient. In our benchmark regression (column 1 of Table 3.1) we find that a one percentage point increase in openness leads to about 0.77% (= 0.034/(1 - .956)) higher income in the long run. This long-effect is lower than the estimated effect that Frankel and Rose (2002. see table II) report. According to their estimations income increases with 1.14% in the long run when the ratio of exports and imports to GDP increases with one percentage point.

Table 3.1 Effect of openness and EU membership on GDP/capita

Regression	(1)	(2)	(3)	(4)
Openness	0.034	0.033	0.028	0.031
	[2.74]	[2.67]	[2.22]	[2.48]
Log Initial GDP/capita	0.956	0.954	0.947	0.939
	[106.03]	[101.70]	[102.04]	[91.83]
Log Investment/GDP ratio	0.007	0.007	0.006	0.005
	[10.45]	[10.48]	[10.36]	[8.31]
Log population	0.000	0.000	0.000	0.000
	[1.43]	[1.27]	[1.69]	[0.26]
Total schooling years	0.007	0.007	0.005	0.005
	[2.28]	[2.32]	[1.58]	[1.88]
EU dummy		0.013		
		[0.75]		
Institutions			-0.032	
			[-3.51]	
South Asia Dummy				-0.060
				[-2.38]
East Asia & Pacific Dummy				-0.011
				[-0.56]
Sub-Saharan Africa Dummy				-0.095
				[-5.17]
Latin America Dummy				-0.055
				[-4.10]
Constant	0.241	0.259	0.412	0.481
	[3.38]	[3.44]	[4.80]	[5.62]
R-squared	0.99	0.99	0.99	0.99
Countries	96	96	96	96
Observations	720	720	720	720

Dependent variable is the logaritme of real GDP per capita. Openness is the sum of exports and imports as a percentage of GDP. Indicator for institutional quality is an overall score of countries in Heritage index.
In our regressions we use eight 5-year periods spanning from 1960 till 2000. Initial GDP per capita refers to GDP per capita at the beginning of each five-year period.
Heteroskedasticity robust standard errors are reported between square brackets. ** indicates statistical significance at 5% level. * at 10% level.

We are also interested in evidence that membership in the EU delivers positive income effects via other routes than trade. For example. joining the union may lead to reduction in uncertainty. stimulating investments. To check this we include the EU dummy together with openness. The coefficient turns out to be positive. but insignificantly different from zero. Evidence for a direct effect of EU membership on income is far from compelling. One reason is that introducing a dummy for membership is an inadequate method to identify the income effects of joining.

The third column of Table 3.1 underlines that institutions do indeed matter for economic performance of countries.[8] It also shows that including a measure for institutional quality in the

[8] As a measure of institutional quality we use the Heritage total score which comprises a number of indicators of institutional climate for the period 1995-2003. For our purposes we average the data over the available time span; in other words we

regression equation changes the coefficient for openness. but not dramatically. The long-run effect falls from 0.77% to 0.53%. Moreover. this conclusion is not sensitive to a choice of a measure of institutional quality. We also tried individual indicators from the Heritage database as well as governance indicators provided by Kaufman et al. (2003) and found that indeed the coefficient remains statistically significant from zero and keeps more or less the same value See appendix).

The regressions analysis is extend to consider the sensitivity of the results. First. a set of regional dummies is included in the regression equation. Indeed. a number of economists have pointed out that location may play a principal role in development. For example. Bloom and Sachs (1998) and Sachs (2001) argue that tropical locations are associated with underdevelopment. Acemoglu. Johnson. and Robinson (2001) suggest that location of countries have influenced how they were treated by their colonizers and consequently which type of institutions have been developed. Yet others stress that geographical location has had a direct effect on technological development of societies (Diamond 1997). To catch allow for some of these effects regional dummies are included (see column four). Again. we see that this does not affect the openness coefficient or its standard deviation very much.

Second. we examine whether openness works differently at different stages of development. In Table A.1 in the appendix we confirm a belief of many economists that trade can significantly contribute to economic situation of countries. especially at lower stages of development.[9] What is striking. however is that the effect of openness on income for upper-middle income countries – where most of CEECs belong -. is three times higher in the short run than in the overall sample. For the long-run effect the difference is much smaller. Moreover. trade also appears to provide the strongest stimulus to economic growth in the upper-middle income countries (Table A.2). Nevertheless. for our further purposes we will use our benchmark estimate in columns 1 or 3 in Table 3.1.

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assume that institutions wile not change over time. The index takes values from one to five, with higher marks indicating worse institutions.

[9] The coefficients for the high income countries are generally lower than for other country groups (with an exception of lower-middle income countries – not shown in the Table A.1 in the Appendix). However, these coefficients are not significantly different from zero for low and lower-middle countries.

4 The effects of EU membership on income

We use the results of the two previous sessions to estimate the effect of EU membership on trade and GDP for the new EU members and three candidate members. These estimates can be considered as the long-run effects of accession. and will not be fully materialized in the first years after accession. We calculate these effects for all ten countries that have acceded the EU in 2004. and the candidate members. Bulgaria. Rumania and Turkey. The results are presented in **Table 4.1** and Table 4.2 .

We compute the effects for regression (3) of the gravity model in Table 2.1. The coefficient for the EU dummy is 0.375 and the coefficients for the level of institutions in the exporting and importing country are 0.224 and 0.242. respectively. The first and second column in **Table 4.1** provide trade shares of individual CEECs with the EU and other CEECs and trade/GDP ratio. respectively. The impact of EU accession on trade is found by multiplying the overall effect of the EU membership as estimated by the gravity equation together with trade share and trade/GDP ratio. Thus. for example the trade openness of the Czech Republic is 123.8% for GDP. Then. as a result of joining the EU together with other CEECs 86.3% of this trade is expected to rise by about 39 percent. The overall trade will hence rise by 38.6% points. (=123.8*86.3*($e^{0.375}$ – 1)).

Moreover. EU accession will probably also stimulate an increase in the quality of institutions. Good institutional quality has an positive effect on trade and investment. We assume that the level of the institutions will converge to the average of the EU15. According to the Heritage index. the levels equals 2.2 (year 2000). The Czech republic and Estonia are the two countries that already reached that level. see column (4). The others have a lower level of institutions according to the heritage index. Take Hungary for example. EU membership will raise overall trade directly by 37.3%. A higher level of institutions will increase trade by another 17.3% points[10]. such that the total trade increase in 54.6% points.

There are considerable differences between countries. While Malta has a potential to increase its trade by more than 120%. Poland can count on an improvement of about 40%. and Turkey by only 30%. Small countries, like Estonia and Malta, are much more open to trade than large countries. Bigger countries can benefit from a larger home market and more varieties of goods produced at home. Turkey. Poland and Rumania are the largest countries and have consequently the lowest trade to GDP ratios. Based on our estimations, by which the benefits of EU integration spillover through trade, large countries benefit less from EU integration than small countries.

Besides the size of the countries, also the level of institutions matters. Although Malta and Estonia are small and very open, the trade gains are much higher for Malta because of the improvement in institutional quality will also stimulate trade.

[10] The quality of institutions for Hungary as exporter and importer are raised from 2.55 to 2.2, such that 17.3%=101.8%*($e^{-0.224*(2.2-2.55)}$ – 1 + $e^{-0.242*(2.2-2.55)}$ – 1).

For the new ten member states of the EU trade could increase by about 55% points on average. On which 60% is an direct effect and 40% an indirect effect through the improvement of the institutions. For the candidate members Bulgaria and Rumania the effects are even larger caused by the large changes in institutions. For Turkey the effects are lower due to the limited openness of the country.

Table 4.1 Effect of the EU Membership on Openness

Country	EU28 trade share (%)	Trade (% GDP)	Direct effect on Trade	level of institutions	Effect of institutions on trade	Total effect on trade
Cyprus	56.0	99.5	25.33	2.55	16.92	42.25
Czech Republic	86.3	123.8	48.57	2.2	0.00	48.57
Estonia	77.4	164.7	57.95	2.2	0.00	57.95
Hungary	80.6	101.8	37.30	2.55	17.31	54.61
Latvia	67.2	106.9	32.66	2.65	23.65	56.31
Lithuania	68.6	105.8	32.99	2.9	37.52	70.51
Malta	62.5	182.5	51.85	2.95	69.75	121.60
Poland	80.8	59.0	21.67	2.8	17.72	39.39
Slovakia	85.6	131.8	51.29	3	54.06	105.34
Slovenia	82.4	114.8	43.00	3	47.08	90.09
Accession 10: weighted average	*79.8*	*91.7*	*33.26*	*2.68*	*21.72*	*54.98*
Bulgaria	71.7	110.9	36.15	3.4	71.62	107.77
Romania	77.9	64.4	22.81	3.3	37.66	60.47
Turkey	66.1	52.3	15.72	2.75	14.31	30.03
Accession 13: weighted average	75.4	77.0	26.39	2.79	22.65	49.04

EU28 trade share is a proportion of trade of accession countries with the EU and other accession countries. It is averaged over the period 1996-2000. Trade (exports and imports) as of GDP ratio is taken from the Penn World Tables 6.1 and is also averaged over the period 1996-2000. Average GDP is used for the weights in the averages for accession 10 and 13.

We have done the same analysis for equation (5) in Table 2.1**Fout! Verwijzingsbron niet gevonden.**. In this regressions we disentangle the effects of EU membership and openness. We have concluded that open countries benefit to a larger extent from EU membership than large countries which are less open. The average result for the ten new EU members are similar as in **Table 4.1**. The variation between the countries is however much larger due to the various levels of openness. The trade effects of EU membership for the candidate countries are smaller because these countries are on average less open. [11]

[11] These results are not presented here, but available upon request by the authors.

After having analysed the trade effects fro the new EU members, we estimate the GDP effects using the results from the growth estimations in Table 3.1. Table 4.2 presents the results using the estimated coefficients for growth regression (1) and (3). The first regression measures the effects of extra openness (due to EU membership) on GDP growth per capita. The second one also separates an effects of changes in the institutions.

The effect of extra openness is measured by using the trade increase in **Table 4.1** times the long-run coefficient of openness on growth. So for the case of the Czech Republic we multiply the trade increase of 48.6% points times 0.33/(1-0.956). This leads to an GDP increase of 37.5%. If we do this for growth equation number 3, the GDP effect is much lower, only 25.7%. The reason is that the estimated long-run coefficient of openness on growth drops from 0.77% to 0.53%, while the improvement of institutions hardly affects growth directly (except indirectly by the trade effect).

The variation in country specific results is fully due to the trade effects. So the effect of Poland is about 30% while Malta could nearly double its GDP.

Table 4.2 Effect of the EU Membership on GDP and relative income after accession

Country	Relative income to EU-15 (2001, ppp terms.)	GDP effect equation (1) in 3.1, openness effect	GDP effect equation (3) in 3.1, openness effect	GDP effect equation (3) in 3.1, institutions effect	On GDP. equation (3) in 3.1. total effect	On relative income using equation (1) in 3.1
Cyprus	87.9	32.65	22.32	1.13	23.45	116.6
Czech Republic	61.1	37.53	25.66	0.00	25.66	84.0
Estonia	42.2	44.78	30.61	0.00	30.61	61.1
Hungary	51.2	42.20	28.85	1.13	29.98	72.8
Latvia	32.1	43.51	29.75	1.45	31.20	46.1
Lithuania	35.2	54.48	37.25	2.27	39.52	54.4
Malta	54.6	93.97	64.24	2.43	66.67	105.9
Poland	39.2	30.44	20.81	1.94	22.75	51.1
Slovakia	49.6	81.40	55.65	2.59	58.25	90.0
Slovenia	71.1	69.61	47.59	2.59	50.19	120.6
Accession 10: weighted average	*45.7*	*42.49*	*29.05*	*1.55*	*30.60*	*65.1*
Bulgaria	28.6	83.27	56.93	3.91	60.85	52.4
Romania	24.2	46.72	31.94	3.58	35.53	35.5
Turkey	24.5	23.20	15.86	1.78	17.64	30.2
Accession 13: weighted average	*33.7*	*37.89*	*25.91*	*1.90*	*27.81*	*46.5*

Trade (exports and imports) as of GDP ratio is taken from the Table 4.1 as also the level of institutions. Average GDP is used for the weights in the averages for accession 10 and 13.
Relative income data are from the World Bank (2003).

On average GDP will increase by about by 42.5%. For all thirteen countries together the effects are slightly lower, because of Rumania and Turkey. If we use the results from growth regression (3) the effects are lower5 but still substantial: 30.6% for the ten new member states. These numbers imply large effect of EU integration on GDP. They indicate that the GDP effects from CGE analyses of EU integration really underestimates the dynamic effect of economic integration. The CGE analyses only consider the static GDP gains. The GDP effects are about five times larger than the largest effects of the static analyses.

These results suggest that EU integration could really help for catching up to the CEE countries to the average level in the EU. For the 10 accession countries their relative income compared to that of the average of 15 EU members is 45.7% (World Bank. 2003). That could increase to 65%, using the GDP increases mentioned in table 4.1. see the last column of **Table 4.2**. This is substantial. For countries like Cyprus. Malta and Slovenia this would even imply that their incomes would exceed the EU-15 average. Table 4.2 presents these results and also for the other countries.

For many other countries like Poland, Latvia and Lithuania and the candidate countries, Rumania and Turkey, EU membership alone is not sufficient for a significant catching up. These countries need also structural reforms to stimulate the growth of their economies.

There is one caveat in these calculations. The GDP increase is based on GDP level measured in constant prices. The comparison of income per capita in ppp terms measures GDP in ppp prices. It can be expected that if GDP increases the lower purchase power prices converge somewhat to the price level in the EU. So the new member states become relatively more expensive in time. This will reduce the relative increase in income per capita somewhat.

It is interesting to compare these results with the catching up process of previous EU enlargements. Sine its accession in 1981 Greece did not succeed in increasing its welfare relative to the EU. Between 1986 and 1995 relative income in Greece even declined to 65%. Since then it rises steadily. Ireland is the example of a successful catching up strategy. In particular in the nineties. economic growth outpaced EU growth by about 2% per year. Nowadays income per capita is among the highest in the EU. Ireland attracted a lot of US multinationals, because of its low taxes. skilled labour force and the language. Its economic success is so extraordinary, that this is probably not a plausible future for most CEE countries. at least not the coming decades.

Spain and Portugal were able to raise their relative income with about 10 to14 points between their accession date in 1986 and 2001. Although it is not clear that the period 1986-2001 represents already the long-term effect, the numbers suggest that catching up is possible.

Table 4.3 Catching-up of other EU countries

Income per capita relative to EU-15 in ppp terms (%)	1986	2001
Greece	74.6	72.4
Ireland	65.7	134.5
Spain	74.2	83.6
Portugal	61.5	75.3

Source: WorldBank (2003). and own calculations

5 Conclusions

In the present paper we have quantified potential impacts – both static and dynamic - of the EU membership on the new members. We find that joining the EU can increase the trade up from 33% to 55%. The lower number reflects the direct effect of membership on trade, and the upper number also includes the indirect effects through changes in the economic institutions. Moreover we estimate that increasing the openness of a country by 1 percentage point can yield more than 0.53% to 0.77% higher income in the long run. Combining the two results we calculate that the new member states can on average count on an improvement of their incomes anywhere from 31% to 43% percent in the long term. These gains vary among the countries depending on how strong is their trading relationship with the current and future member states as well as on the openness of their economies. Hence Slovakia – a small country which is very open and at the same time most of its trade occurs with the EU - is expected to see the best improvements; both in terms of higher trade as well as consequent boost of income. However the size of these effects is not a reason for celebration in all countries. At the current situation where the income of the new member states is about 45% of the EU average in purchase power terms. It will take a few generations before accession countries get anywhere close to the EU standard. This is certainly the case for countries like Poland and the Baltic States and is also true for the other candidates of EU membership: Bulgaria, Rumania. and Turkey.

Our estimates are higher than those appearing in the literature. Most of the CGE simulations show GDP gains between the 1.5% and 7.8%. In general these simulations do not take account of the dynamic effect of economic integration. These dynamic effects are included in our regressions. We did not investigate the determinants of these dynamic effects. We will finish here with some indications to these determinants based on a growth accounting exercise.

We assume the GDP growth can be explained by labour growth, capital growth and TFP growth. According to Crafts and Kaiser, labour growth will be negligible the coming decades. Of course it is possible that the quality of labour increases due to extra schooling. We assume that the quality effect is part of the TFP increase. If savings and FDI grow at least the same pace as GDP. capital will grow at the same pace. If the capital share in production is 35%, 35% of GDP growth can by explained by capital growth. For most countries that catch up capital growth outpaces GDP growth. Recent work from Jungmittag (2004) even suggests that capital even contributes for about 50% to convergence of labour productivities in the EU.

Based upon this reasoning TFP growth has to contribute for 50% to 65% to GDP growth to explain GDP increases due to EU membership. One of the possible dynamic gains of trade are trade-related TFP increases. Coe and Helpman (1995) suggest that foreign R&D spillovers are important for TFP growth. We have used the empirical results of Hofmaister, Coe and Helpman (1998) to test this idea. Because foreign spillovers depend on the import ratio, the increase in trade raises the size of the foreign spillovers. Using their estimated equation table presents the effects of extra R&D spillovers on TFP growth. The results in table 5.1 suggest that the extra

foreign R&D spillovers explain about 15% to 20% of GDP growth. This implies that a substantial part of the necessary TFP increase can be explained by R&D spillovers. but also that an even large share remains unexplained. This is not surprising. R&D spillovers are only a part of the story. Technology diffusion to catching up countries and imitation also takes place by other channels such as foreign direct investment.

Table 5.1 TFP increase caused by R&D spillovers

TFP Elasticities	Effects of the EU on trade (%, see table 4.1)	Increase in TFP	GDP growth (see table 4.2)
Cyprus	42.25	6.37	32.65
Czech Republic	48.57	7.35	37.53
Estonia	57.95	8.83	44.78
Hungary	54.61	8.30	42.20
Latvia	56.31	8.57	43.51
Lithuania	70.51	10.85	54.48
Malta	121.60	19.44	93.97
Poland	39.39	5.92	30.44
Slovakia	105.34	16.64	81.40
Slovenia	90.09	14.06	69.61
Bulgaria	107.77	17.05	83.27
Romania	60.47	9.23	46.72
Turkey	30.03	4.48	23.20

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Appendix A: Additional Results

Table A.1 Effect of openness and EU membership on GDP/capita (various samples)

		Full	Low Income		Lower Middle Income		Upper Middle Income		High Income			OECD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Openness	0.034	0.028	0.069	0.066	0.062	0.061	0.087	0.099	0.042	0.037	0.045	0.054
	[2.74]	[2.22]	[1.25]	[1.18]	[1.97]	[1.90]	[2.04]	[2.29]	[4.47]	[3.73]	[2.02]	[2.42]
Log Initial GDP/capita	0.956	0.947	0.922	0.923	0.909	0.909	0.875	0.887	0.861	0.851	0.896	0.875
	[106.03]	[102.04]	[40.86]	[40.48]	[50.74]	[50.61]	[26.03]	[25.64]	[64.20]	[58.99]	[65.80]	[54.06]
Investment/GDP ratio	0.007	0.006	0.006	0.006	0.004	0.004	0.003	0.003	0.002	0.002	0.006	0.006
	[10.45]	[10.36]	[3.53]	[3.51]	[3.78]	[3.77]	[1.30]	[1.39]	[2.49]	[2.63]	[6.75]	[7.17]
Log population	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[1.43]	[1.69]	[2.12]	[2.05]	[2.99]	[2.85]	[-0.43]	[-0.10]	[3.02]	[3.16]	[1.89]	[2.48]
Total schooling years	0.007	0.005	-0.009	-0.009	-0.011	-0.010	0.007	0.001	0.007	0.007	0.006	0.007
	[2.28]	[1.58]	[-0.82]	[-0.79]	[-1.97]	[-1.86]	[0.80]	[0.05]	[1.87]	[2.06]	[1.82]	[2.12]
Institutions		-0.032		-0.009		0.003		-0.063		-0.017		-0.023
		[-3.51]		[-0.29]		[0.17]		[-1.36]		[-1.87]		[-2.31]
Constant	0.241	0.412	0.315	0.344	0.574	0.568	1.076	1.133	1.212	1.339	0.796	0.995
	[3.38]	[4.80]	[1.67]	[1.60]	[3.74]	[3.59]	[4.03]	[4.21]	[11.25]	[10.56]	[6.76]	[6.86]
R-squared	0.99	0.99	0.91	0.91	0.94	0.94	0.93	0.93	0.98	0.98	0.98	0.98
Countries	96	96	29	29	25	25	13	13	28	28	27	27
Observations	720	720	202	202	193	193	98	98	220	220	208	208

Dependent variable: Log Real GDP/capita

[] report t-statistics. () report p-values

** significant at 5 level. * significant at 10 level

Openness = (exports + imports)/GDP. Indicator for institutions is an overall score of countries in Heritage index.

In our regressions we use eight 5-year periods spanning from 1960 till 2000.

Initial GDP/capita refers to GDP/capita at the beginning of each period.

Table A.2 Effect of openness and EU membership on economic growth (various samples)

		Full	Low Income		Lower Middle Income		Upper Middle Income		High Income			OECD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Openness	0.007	0.006	0.003	0.003	0.008	0.008	0.028	0.031	0.009	0.009	0.013	0.014
	[2.48]	[1.99]	[0.21]	[0.22]	[0.90]	[0.91]	[3.12]	[3.37]	[4.05]	[3.62]	[2.25]	[2.52]
Log Population	0.001	0.002	0.004	0.004	0.005	0.005	0.001	0.002	0.002	0.002	0.002	0.002
	[1.88]	[2.11]	[1.75]	[1.73]	[2.98]	[2.92]	[0.39]	[0.74]	[2.22]	[2.29]	[1.80]	[2.20]
Log Initial GDP/capita	-0.012	-0.013	-0.017	-0.017	-0.023	-0.023	-0.029	-0.026	-0.032	-0.034	-0.025	-0.028
	[-5.57]	[-6.15]	[-3.54]	[-3.51]	[-5.06]	[-5.04]	[-4.03]	[-3.55]	[-9.46]	[-9.16]	[-7.45]	[-7.21]
Investment/GDP ratio	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	[11.31]	[11.25]	[4.23]	[4.12]	[4.10]	[4.09]	[2.31]	[2.39]	[2.68]	[2.74]	[6.41]	[6.63]
Population growth rate	-0.003	-0.003	0.000	0.000	-0.002	-0.002	-0.009	-0.009	-0.001	-0.001	-0.001	-0.001
	[-2.41]	[-2.14]	[-0.16]	[-0.15]	[-0.77]	[-0.74]	[-2.14]	[-2.10]	[-0.55]	[-0.58]	[-0.75]	[-0.61]
Total schooling years	0.001	0.001	0.000	0.000	-0.003	-0.003	-0.003	-0.004	0.002	0.002	0.001	0.001
	[1.81]	[1.31]	[0.12]	[0.12]	[-2.00]	[-1.99]	[-1.02]	[-1.48]	[2.18]	[2.27]	[1.66]	[1.85]
Institutions		-0.006		0.000		-0.001		-0.015		-0.002		-0.004
		[-2.93]		[0.07]		[-0.19]		[-1.49]		[-0.97]		[-1.60]
Constant	0.071	0.102	0.081	0.079	0.151	0.152	0.256	0.268	0.287	0.302	0.196	0.227
	[4.05]	[5.00]	[1.88]	[1.62]	[3.67]	[3.63]	[4.25]	[4.45]	[10.57]	[9.54]	[6.37]	[6.26]
R-squared	0.22	0.22	0.18	0.18	0.26	0.26	0.33	0.35	0.49	0.49	0.36	0.37
Countries	96	96	29	29	25	25	13	13	28	28	27	27
Observations	716	716	201	201	191	191	97	97	220	220	208	208

Dependent variable: growth rate

[] report t-statistics. () report p-values

** significant at 5 level. * significant at 10 level

Openness = (exports + imports)/GDP. Indicator for institutions is an overall score of countries in Heritage index.

In our regressions we use eight 5-year periods spanning from 1960 till 2000.

Initial GDP/capita refers to GDP/capita at the beginning of each period.

Table A.3 Effect of openness on GDP/capita (with various measurements of institutional quality)

	money	fdi	finance	property	regulation	Bm	voice	stability	effective	regulatory	law	corrupt
Openness	0.031	0.033	0.032	0.028	0.018	0.028	0.045	0.033	0.023	0.026	0.029	0.032
	[2.48]	[2.68]	[2.59]	[2.31]	[1.45]	[2.31]	[3.55]	[2.68]	[1.90]	[2.17]	[2.40]	[2.62]
Institutions	-0.012	-0.002	-0.011	-0.026	-0.040	-0.025	0.030	0.034	0.059	0.052	0.055	0.043
	[-2.96]	[-0.33]	[-1.74]	[-4.38]	[-5.63]	[-5.00]	[3.56]	[4.71]	[7.60]	[5.72]	[6.87]	[5.77]
R-squared	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Countries	96	96	96	96	96	96	96	96	96	96	96	96
Observations	720	720	720	720	720	720	720	720	720	720	720	720

Notes:

Dependent variable: Log Real GDP/capita. Additional Independent variables: log population; log initial GDP/capita. investment/GDP ratio. total schooling years. constant.

[] report t-statistics. () report p-values. ** significant at 5 level. * significant at 10 level

Openness = (exports + imports)/GDP. Initial GDP/capita refers to GDP/capita at the beginning of each period.

In our regressions we use eight 5-year periods spanning from 1960 till 2000.

Heritage indicators:

- money – Monetary policy
- fdi – Foreign Direct Investment
- finance – Banking and Finance
- property – Property Rights
- regulation – Regulation
- bm – Black Market

Kaufman Indicators:

- voice – Voice and Accountability
- stability – Political Stability
- effective – Government Effectiveness
- regquality – Regulatory Quality
- Law – Rule of Law
- corrupt – Control of Corruption

Appendix B: Data Sets

In our paper we use two different data sets. The first one is to estimate the bilateral trade in the gravity model and thus quantify the effect of the EU membership on trade. With the second set we assess the impact of openness on per capita income.

The (full) trade set consists of 45.712 observations for which the following variables are available: bilateral trade. distance. GDP and GDP/capita of both exporter and the trade partner and dummies on EU membership. common border and language. and membership to one of the regional trade agreements. For a restricted data set which includes 34.592 observations a number of additional variables is available. They include number of landlocked countries. product of land areas of trade partners. and three political dummy variables: common colonizer. ex-colony/colonizer. and political union. These were taken from Frankel and Rose (2002). Trade data were obtained from PC-TAS (Personal Computer Trade Analysis System) CD-ROM of the *International Trade Center UNCTAD/WTO* which is derived from the trade database of United Nations Statistics Division COMTRADE. We use data from *Penn World Table (PWT) 6.1* for population and real GDP per capita. Distance and dummies on contiguity and language come from database of *Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).* Regional agreements are separated into four dummies: EU. APEC and FTA. The latter includes membership in trade enhancing agreements: Canada-US FTA. ANDEAN. CACM. MERCOSUR. GR3. LAIA. CARICOM. ASEAN. CBI. EAC. EMCCA. ECOWAS. COMESA. IOC. SADC. ECWA. WAEMU. SACU. ECCGL. GCC. and SAARC. The governance indicators are taken from the *Index of Economic Freedom* issued by *Heritage Foundation*.

The second data set includes a panel of 96 countries and covers the period 1960-2000 in five year spans. The total sample consists of 716 observations. GDP per head. openness. investments. and population are taken from *Penn World Table (PWT) 6.1*. The proxy for human capital – total years of schooling come from Barro-Lee data set which encompasses educational attainment of population for 138 countries. Indicators of governance are taken from two sources: *The Index of Economic Freedom* of the Heritage Foundation and Kaufman et al. (2003). The regional dummy variables have been produced on the basis of World Bank classification.

Appendix C: Sample of countries in gravity equations

Albania (r)
Algeria (r)
Angola (r)
Antigua &Barmuda (r)
Argentina (r)
Armenia
Australia (r)
Austria (r)
Azerbaijan
Bahamas (r)
Bahrain (r)
Bangladesh (r)
Barbados (r)
Belarus
Belgium (r)
Belize (r)
Benin (r)
Bermuda (r)
Bhutan (r)
Bolivia (r)
Brazil (r)
Bulgaria (r)
Burkina Faso (r)
Burundi (r)
Cambodia (r)
Cameroon (r)
Canada (r)
Cape Verde
Central African
Republic (r)
Chad (r)
Chile (r)
China (r)
Colombia (r)
Comoros (r)
Congo (r)
Congo. Dem. Rep. (r)
Costa Rica (r)
Cote d'Ivoire (r)
Croatia.
Cuba (r)
Cyprus (r)
Czech Republic (r)
Denmark (r)
Djibouti (r)
Dominica (r)
Dominican Rep. (r)
Ecuador (r)
Egypt (r)
El Salvador (r)
Equatorial Guinea (r)
Eritrea.
Estonia
Ethiopia (r)
Fiji (r)
Finland (r)
France (r)
Gabon (r)
Gambia (r)
Georgia
Germany (r)
Ghana (r)
Greece (r)
Grenada (r)
Guatemala (r)
Guinea (r)
Guinea-Bissau (r)
Guyana (r)
Haiti (r)
Honduras (r)
Hong Kong (r)
Hungary (r)
Iceland (r)
India (r)
Indonesia (r)
Iran (r)
Ireland (r)
Israel (r)
Italy (r)
Jamaica (r)
Japan (r)
Jordan (r)
Kazakhstan
Kenya (r)
Korea. Rep. of (r)
Kuwait (r)
Kyrgyzstan
Laos (r)
Latvia
Lebanon (r)
Lesotho
Lithuania
Macao
Madagascar (r)
Malawi (r)
Malaysia (r)
Mali (r)
Malta (r)
Mauritania (r)
Mauritius (r)
Mexico (r)
Moldova
Mongolia (r)
Morocco (r)
Mozambique (r)
Nepal (r)
Netherlands (r)
New Zealand (r)
Nicaragua (r)
Niger (r)
Nigeria (r)
Norway (r)
Oman (r)
Pakistan (r)
Panama (r)
Papua New Guinea (r)
Paraguay (r)
Peru (r)
Philippines (r)
Poland (r)
Portugal (r)
Qatar (r)
Russia
Rwanda (r)
Saint Kitts and Nevis
(r)
Saint Lucia (r)
Saint Vincent and the
Grenadines (r)
Sao Tome and
Principe
Saudi Arabia (r)
Senegal (r)
Seychelles (r)
Sierra Leone (r)
Singapore (r)
Slovenia
South Africa (r)
Spain (r)
Sri Lanka (r)
Sudan (r)
Sweden (r)
Switzerland (r)
Syria (r)
Taiwan
Tajikistan
Tanzania (r)
Thailand (r)
Togo (r)
Trinidad and Tobago
(r)
Tunisia (r)
Turkey (r)
Turkmenistan
Uganda (r)
Ukraine
United Kingdom (r)
United States (r)
Uruguay (r)
Uzbekistan
Venezuela (r)
Viet Nam (r)
Yemen (r)
Zambia (r)
Zimbabwe (r)

NB: All of the listed countries are used in the full sample. while only those succeeded by '(r)' are included in the restricted sample.

Appendix D: Sample of countries in growth equations

Low income
Bangladesh (SAS)
Benin (SSA)
Burundi (SSA)
Cameroon (SSA)
Central African Republic (SSA)
Congo. Republic of (SSA)
Gambia (SSA)
Ghana (SSA)
Haiti (LAC)
India (SAS)
Indonesia (EAP)
Kenya (SSA)
Lesotho (SSA)
Malawi (SSA)
Mali (SSA)
Mauritania (SSA)
Mozambique (SSA)
Nepal (SAS)
Nicaragua (LAC)
Niger (SSA)
Pakistan (SAS)
Papua New Guinea (EAP)
Rwanda (SSA)
Senegal (SSA)
Sierra Leone (SSA)
Togo (SSA)
Uganda (SSA)
Zambia (SSA)
Zimbabwe (SSA)

Lower Middle Income
Algeria
Bolivia (LAC)
Brazil (LAC)
China (EAP)
Colombia (LAC)
Dominican Republic (LAC)
Ecuador (LAC)
Egypt
El Salvador (LAC)
Fiji (EAP)
Guatemala (LAC)
Guyana (LAC)
Honduras (LAC)
Iran
Jamaica (LAC)
Jordan
Paraguay (LAC)
Peru (LAC)
Philippines (EAP)
South Africa (SSA)
Sri Lanka (SAS)
Syria
Thailand (EAP)
Tunisia
Turkey

Upper Middle Income
Argentina (LAC)
Botswana (SSA)
Chile (LAC)
Costa Rica (LAC)
Hungary
Malaysia (EAP)
Mauritius (SSA)
Mexico (LAC)
Panama (LAC)
Poland
Trinidad &Tobago (LAC)
Uruguay (LAC)
Venezuela (LAC)
Taiwan (EAP)

High Income
Australia
Austria
Barbados
Belgium
Canada
Cyprus
Denmark
Finland
France
Germany
Greece
Hong Kong
Iceland
Ireland
Israel
Italy
Japan
Korea. Republic of
Netherlands
New Zealand
Norway
Portugal
Singapore
Spain
Sweden
Switzerland
United Kingdom
USA

OECD
Australia
Austria
Belgium
Canada
Denmark
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Korea. Republic of
Mexico (LAC)
Netherlands
New Zealand
Norway
Poland
Portugal
Spain
Sweden
Switzerland
Turkey
United Kingdom
USA

Countries are grouped according to income classification provided by the World Bank. Abbreviations in the parentheses refer to regional classification by the World Bank which is used to create region dummies in Table II.

SAS – South Asia

EAP – East Asia and Pacific

SSA – Sub-Saharan Africa

LAC – Latin America and Caribbean