CPB Discussion Paper

No 72

October 2006

EU accession and income growth

An empirical approach

Arjan M. Lejour*, Vladimir Solanic, Paul J.G. Tang*****

* CPB Netherlands Bureau for Economic Policy Analysis, P.O. Box 80510, 2508 GM The Hague, the Netherlands, e-mail: a.m.lejour@cpb.nl,

** Ministry of Finance, Slovakia, e-mail: vsolanic@mfsr.sk

*** Ministry of Economic Affairs, P.O. Box 20101, 2500 EC The Hague, the Netherlands, e-mail: p.j.g.tang@minez.nl

CPB Netherlands Bureau for Economic Policy Analysis
Van Stolkweg 14
P.O. Box 80510
2508 GM The Hague, the Netherlands

Telephone +31 70 338 33 80
Telefax +31 70 338 33 50
Internet www.cpb.nl

ISBN 90-5833-296-9

Abstract in English

The dynamic effects 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 increase trade between two of its member states with about 34%. EU membership may contribute to trade by inducing countries to improve the quality of their institutions. Trade increases by another 22% if institutions improve, yielding a total trade increase of 56%. Improved openness increases income by 37.5% according to our estimates. Adding a small direct effect of improved institutions on income, the total income effect of EU membership is 39% for the ten new members. 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 on par with the old member states.

Key words: income and openness, EU accession, gravity equation

JEL code: F15, F43

Abstract in Dutch

De dynamische effecten van het EU-lidmaatschap zijn cruciaal voor de nieuwe lidstaten om naar het gemiddelde inkomen van de oude lidstaten toe te groeien. Voor een kwantitatieve invulling van de dynamische effecten volgen we een twee-stapsmethode. We gebruiken een graviteitsvergelijking voor bilaterale handel om het handelseffect van EU-lidmaatschap te bepalen. Daarnaast schatten we een groeivergelijking om het inkomenseffect van meer handel te duiden. Gedeeld EU-lidmaatschap vergroot de handel tussen twee lidstaten met ongeveer 34%. EU-lidmaatschap kan ook de kwaliteit van de instituties in landen stimuleren. Als deze instituties verbeteren, neemt de handel met 22% toe, zodat het totale handelseffect 56% bedraagt. Deze handelstoename kan het inkomen met 38% doen toenemen volgens onze schattingen. Met een klein direct effect van verbeterde instituties op groei is het totale inkomenseffect 39%. Dit betekent dat EU-lidmaatschap, via het effect op handel en instituties, tot grote economische voordelen voor de nieuwe lidstaten kan leiden, maar dat brengt ze nog niet op het inkomensniveau van de oude lidstaten.

Steekwoorden: inkomen en openheid, EU-toetreding, graviteitsvergelijking

Een uitgebreide Nederlandse samenvatting is beschikbaar via www.cpb.nl.

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Summary

In May 2004, the European Union expanded by 10 countries: eight countries from Central and Eastern Europe (CEE) and Cyprus and Malta. This was the largest expansion in the history of the European Union. For the eight countries, this marked the end of their transition from a centrally planned economy and a one-party system towards a market economy and a democratic structure.

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). 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.

The central 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 most recent studies 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.

The studies in the second category use regression analysis to gauge the overall effect of EU membership on income (growth). These studies take implicitly also account of the dynamic gains of trade such as 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).

We reconsider the effect on EU membership on economic growth, with a particular focus on the productivity 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. 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). Introducing measures for institutional quality 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 for the new member states. First, EU membership is estimated to increase trade with roughly 56%. The effects for the individual CEE countries vary widely. To a large extent this variation depends on a country's openness in combination with the intensity of its trade with the EU and on the quality of the institutions. Second, a one percentage point increase in openness, i.e. the ratio of trade to GDP, expands output by about 0.7% in the long run. Combining the two effects, the new EU members can experience on average an increase in their real income of roughly 39% 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 63% of the EU-15 average. That is a significant decline of the income gap, although much remains to be done for closing it.

1 Introduction[1]

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, 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.

[1] We gratefully acknowledge comments by George Gelauff, Volker Nitsch and Theo van de Klundert.

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).[2]

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

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

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 the regression. With a similar data set Vanhoudt (1998) did not find a permanent growth effect of EU accession. Badinger (2005) 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 on 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. [3]

In this paper we reconsider the effect on EU membership on economic growth, with a particular focus on the productivity 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 supports a positive link between the quality of institutions and economic growth.[4] Rodrik and Subramanian (2003) even claim that institutions trump

[3] 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.

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

everything else in explaining growth. Empirical work also finds a strong relation between the institutional quality and trade flows.[5] De Groot *et al*. (2004) emphasize furthermore that 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 for the new member states. First, EU membership is estimated to increase trade with roughly 56%. The effects for the individual CEE countries vary widely. To a large extent this variation depends on a country's openness in combination with the intensity of its trade with the EU and on the quality of the institutions. Second, a one percentage point increase in openness, i.e. the ratio of trade to GDP, expands output by about 0.7% in the long run. Combining the two effects, the new EU members can experience on average an increase in their real income of roughly 39% 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 63% 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 estimation 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.

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

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 is more intense when the two trading partners are *both* EU member. Also included are dummies for membership of the Asia-Pacific Economic Cooperation (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 (2004) 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 fact that the thinner the market is the higher is the variance.

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.[6] 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, 0.53, implies that common membership leads to 70% extra trade between the two trading partners. Clearly, this is an important effect. This effect is somewhat larger than in earlier studies.[7]

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 Frankel and Rose (2002). The effect of OECD membership, excluding the EU members, is modest, however (equation 2).[8] In contrast to Rose (2004)'s results, our regression has - reassuringly - the outcome that trade-promoting institutions indeed promote trade.

Within the European Union institutional quality is high. For example, corruption does not occur at a large scale, government procedures are fairly transparent and the social-political conditions are stable. This level of quality is conducive to international trade. Alternatively, the

[6] Exports are expressed as a share of GDP in the origin country. One could thus transfer log GDP in the origin country from the left to the right hand side of equation (2.1). Then the values of coefficients for both GDP's are nearly identical.

[7] 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 Fidrmuc (2003) report a 40% increase in bilateral trade, and Lejour *et al.* (2004) a 50% increase.

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

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 show that including measures for institutional quality reduces the effect of EU membership. In the specification with the dummy for the APEC membership, the coefficient for the EU dummy falls from 0.53 to 0.38 (column 1 versus column 3).

With specification (2.1) EU membership 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 intra-EU export is about 110%, whereas for Germany with an openness of about 50% the increase is about 25%.

The estimation results give the conclusion that EU membership has a clear, strong effect on international trade. Not only lower barriers to trade give rise to increased trade, but also better institutions, almost imposed on new member states, lead to more trade within an expanded Union. This concludes the first step. The next section describes the second step, where the effects of more trade (and better institutions) on income are estimated.

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

Regression	(1)	(2)	(3)	(4)	(5)	(6)
Constant	– 21.655***	– 22.862***	– 18.950***	– 19.867***	– 21.702***	– 19.020***
	[– 133 0]	[– 136.4]	[– 78.4]	[– 78.0]	[– 133.1]	[– 78.5]
EU dummy	0.527***	0.398***	0.380***	0.246***	0.037	– 0.078
	[20.5]	[15.0]	[14.3]	[9.0]	[0.7]	[– 1.5]
EU * openness					0.006***	0.006***
					[10.8]	[9.8]
APEC	1.251***		1.166***		1.177***	1.125***
	[40.1]		[36.4]		[24.5]	[23.1]
APEC * openness					0.001*	0.001
					[1.8]	[1.0]
OECD (excluding EU)		0.086**		0.064		
		[2.2]		[1.5]		
Log GDP exporter	– 0.165***	– 0.135***	– 0.146***	– 0.116***	– 0.161***	– 0.143***
	[– 38.2]	[– 29.9]	[– 30.9]	[– 23.5]	[– 37.2]	[– 30.1]
Log GDP importer	0.776***	0.807***	0.793***	0.826***	0.775***	0.793***
	[172.3]	[176.9]	[166.1]	[170.9]	[172.2]	[166.0]
Log GDP per capita exporter	0.504***	0.514***	0.405***	0.403***	0.501***	0.404***
	[59.0]	[58.4]	[32.8]	[30.9]	[58.5]	[32.7]
Log GDP per capita importer	0.499***	0.505***	0.392***	0.390***	0.500***	0.393***
	[58.3]	[56.8]	[32.0]	[30.4]	[58.4]	[32.1]
Log distance	– 0.814***	– 0.816***	– 0.837***	– 0.841***	– 0.812***	– 0.835***
	[– 98.2]	[– 95.3]	[– 96.1]	[– 93.0]	[– 97.8]	[– 95.6]
Common border	0.595***	0.583***	0.591***	0.582***	0.604***	0.599***
	[17.2]	[16.4]	[16.7]	[16.0]	[17.4]	[17.0]
Common language	0.854***	0.938***	0.756***	0.828***	0.852***	0.754***
	[36.5]	[40.3]	[30.7]	[33.8]	[36.2]	[30.5]
Institutional quality exporter			– 0.225***	– 0.249***		– 0.221***
			[– 14.5]	[– 14.7]		[– 14.3]
Institutional quality importer			– 0.243***	– 0.261***		– 0.243***
			[– 13.9]	[– 13.9]		[– 14.0]
Weighted R-squared	0.596	0.582	0.568	0.554	0.597	0.569
Observations	45712	45712	41676	41676	45712	41676

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

Heteroskedasticity robust t values are reported between square brackets. . *, ** and *** denote statistical significance at the 10%, 5% and 1% level,

The sample spans the period 1996-2000. Year dummies are included and statistically significant at the 1% level but not reported.

3 Trade and income

From a theoretical perspective there are good reasons to believe that better possibilities for international trade give rise to higher production and productivity. For example, 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. Moreover, endogenous growth theories usually emphasize the dynamic gains of increased openness: via international exchange of goods and through international contacts firms are able to tap foreign knowledge and ideas which help them to speed up the pace of innovation.

Indeed, the bulk of recent empirical research supports the link from openness to growth. A run-of-the mill specification takes the growth rate or the income level as a dependent variable and a measure of openness together with other neoclassical growth variables as independent variables. The most widely used variable – which we will also use in our analysis – is the ratio of trade to GDP. Usually this ratio is found to have a positive and significant effect on growth.[9]

Various aspects of the empirical approach to trade and growth have generated discussion in the literature. Rodriguez and Rodrik (2003) put into doubt whether the empirical outcomes are robust: changes in the sample of countries or in the estimation form can easily lead to important changes in the estimation results. How compelling this argument is, is not clear. First of all, it seems true for most multi-country, multi-period estimations. Second, a study that comes up with a negative relation between trade and income (growth) is hard to find. Edwards (1998) uses nine indicators for openness and two regression methods and concludes that in all cases, except one, the coefficient has the expected sign. In thirteen cases the coefficient is statistically significant. Alesina *et al*. (2003) conclude therefore that the range of possible effects is bounded below by zero. For this and other reasons, most economists tend to assume a positive effect of trade on income.

Robust or not, the outcomes can be given different interpretations: the causality may run either direction. To correct for simultaneity, Frankel and Romer (1999) use geographic characteristics such as distance, common borders and common language as instrumental variables. In this way they hope to obtain unbiased estimates of the effect of trade on income. They find that trade has a robust, positive, large effect on income. In fact, correcting for simultaneity leads to larger coefficients. Irwin and Terviö (2000) support these findings for an extended sample period. According to both studies estimations using instrumental variables (IV) lead to higher coefficients than estimations using ordinary least squares (OLS).

This paper is not intended to discuss empirical problems at great length and to deal with them. Instead, the aim is more modest and rather practical: what do the usual estimations imply for the (dynamic) benefits of EU membership? This section reports a rather common growth regression, from which we derive the empirical estimate for the effect of trade on income. The

[9] Good surveys of literature are Dollar (1992) and Edwards (1993), but also Srinivasan and Wallack (2004).

estimate is rather conservative. First, the regression equation is estimated with OLS and not with IV (see above). Second, the equation does not take into account that better possibilities for international trade may lead to higher income by stimulating investment in physical and human capital. Instead, the regression yields only an estimate for the direct effect of trade on income.

Following Mankiw, Romer, and Weil (1992), a classical Solow growth equation is estimated, where income (growth) is related to initial income and accumulation of physical and human capital. The investment in human capital takes several forms: population growth, enrolment in primary education and enrolment in secondary education. Added to this equation is a measure for openness. More specifically, openness is defined as the value of import and exports as a ratio of GDP. A positive effect of openness on income in combination with higher openness for smaller economies would imply that breaking up a larger economy into smaller ones will boost income on aggregate. This overlooks, among other things, economies of scale, which larger economies may enjoy. To allow for a non-linear relation between country size and income, the growth equation included openness in quadratic form as well as the population size.

We use a panel covering the period 1960-2000 which we divide it into eight five-year intervals. The variables are averaged over these intervals. The exception is initial income, which is given the value 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.

The specification slightly differs from Frankel and Rose (2002). First, 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 following Islam (1995). Second,, we have included openness in quadratic form as well as population size. Edwards (1998) also includes quadratic terms for openness indicators to test for nonlinearities between openness and growth. In some cases the coefficient is significant, indicating that the effect of openness on growth peters out. This is plausible: one of the reasons why openness should have a positive effect on income is the exploitation to economies of scale. Alesina *et al*. (2003) show empirically that the effect of openness on growth is larger for small countries than for large countries. Small countries need foreign markets in order to benefit from scale effects. This is in particular relevant for smaller countries, such as most of the CEE countries. However, if these countries are well integrated with international markets and already exploit their economies of scale, one could expect that further increases in openness contribute less to income.

Table 3.1 presents the estimation results. In the first column the traditional controls of the neoclassical growth model turn out, with an exception of the enrolment in primary education and population growth, to be statistically significant. It is not uncommon for proxies for human capital to have a statistically insignificant effect. This is also the case in the study by 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 can be acquired in different ways.

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

Regression	(1)	(2)	(3)	(4)
Openness	0.060**	0.059*	0.070**	0.036
	[2.01]	[1.95]	[2.41]	[1.21]
Openness^2	– 0.010	– 0.009	– 0.016*	– 0.003
	[– 1.02]	[– 0.99]	[– 1.76]	[– 0.30]
Population (log)	0.007*	0.007*	0.008**	0.002
	[1.92]	[1.83]	[2.36]	[0.67]
Initial income (log)	0.954***	0.953***	0.944***	0.933***
	[105.10]	[104.02]	[100.49]	[82.44]
Investment rate (log)	0.007***	0.007***	0.007***	0.005***
	[9.47]	[9.42]	[9.49]	[6.90]
Population growth	– 0.460	– 0.446	– 0.304	0.091
	[– 0.50]	[– 0.47]	[– 0.34]	[0.10]
Enrolment primary education	0.000	0.000	0.000	0.001**
	[1.30]	[1.30]	[0.72]	[2.22]
Enrolment secondary education	0.001**	0.001**	0.001	0.001**
	[2.04]	[2.01]	[1.41]	[2.27]
EU dummy		0.002		
		[0.14]		
Institutional quality			– 0.034***	
			[– 3.14]	
South Asia				– 0.070***
				[– 3.09]
East Asia & Pacific				– 0.036*
				[1.79]
Sub-Saharan Africa				– 0.104***
				[– 4.90]
Latin America				– 0.068***
				[– 4.43]
Constant	0.234**	0.236**	0.401	0.504
	[2.37]	[2.38]	[3.73]	[4.58]
R^2	0.987	0.987	0.987	0.988
Countries	96	96	96	96
Observations	720	720	720	720

Dependent variable is the logarithm 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 student t values are reported between square brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level.

We focus on the coefficient of openness. As we have mentioned above, the openness variable may affect accumulation. We are aware that induced factor accumulation will not be attributed to changes in openness in our specification, leading to a downward biased coefficient. In the first regression we find that a one percentage point increase in openness leads[10] to about 0.98% higher income in the long run. This long-term effect equals the estimated effect of Frankel and Rose (2002, see table II). According to them, income increases with 1.14% in the long run when the ratio of exports and imports to GDP increases with one percentage point. Note that these effects are substantially lower than the coefficient of 2 found by Romer and Weil (1999) who correct for possible simultaneity between trade and income using an IV estimator. The coefficient of 2 is large, but also Edwards (1998) finds for most of his openness indicators higher coefficients if these are estimated with IV than if these are estimated with weighted least squares.

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 investment. To check this we include a dummy for EU membership. The results in the second column show that the coefficient is positive, but insignificantly different from zero. Including a dummy does not yield convincing evidence for economic benefits from EU membership.

The third column of Table 3.1 underlines that institutions do indeed matter for economic performance of countries.[11] It also shows that including a measure for institutional quality in the regression equation changes the coefficient for openness. The long-run effect remains nearly the same for average openness: it changes from 0.98% to 1.02%. Besides, the quadratic term becomes statistically significant. Combined with a positive coefficient for population size, this suggests that country size does not have an unequivocal effect. The results in the third column are not sensitive to a choice of a measure of institutional quality. We have tried individual indicators from the Heritage database as well as governance indicators provided by Kaufman *et al*. (2003) and found that indeed the coefficients remain statistically significant from zero and keep more or less the same value (see appendix A).

The results in the fourth column appear when a set of regional dummies is included in the regression equation. 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 the location is decisive which type of (colonial) institutions has been developed. Yet others stress that geographical location has had a direct effect on technological

[10] For an average value for openness of 69.1%

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

development of societies (Diamond, 1997). To allow for location, at least to some degree, regional dummies are included. This has an effect on the coefficients for openness and their standard deviations. Neither of the two terms is statistically significant. When, however, the quadratic term is dropped from the equation, the linear term is statistically significant.

Not shown are regression results where openness is allowed to have a different effect at different stages of development. The results agree with the belief of many economists that especially at the initial stages of development trade can significantly contribute to the economic situation of countries.[12] What is striking, however, is that the short-run effect of openness on income for upper-middle income countries – where most of CEEs belong to – is three times higher than for the overall sample. For the long-run effect the difference is much smaller.

The estimation results show openness has clear and important effect on income. When a measure for institutional quality is included, this effect becomes smaller but remains significant. The EU membership can contribute to income (growth) of a new member state in (at least) two ways: by improving institutions in the new member states and by stimulating trade between the new and the other member states. In the next section this second step is combined with the first step to calculate the implied (dynamic) benefits of EU membership.

[12] The coefficients for the high income countries are generally lower than for other country groups (with an exception of lower-middle income countries.

4 The effects of EU membership on income

We use the results of the two previous sections to calculate the implied effect of EU membership on trade and GDP for the new EU members and three candidate members. The effect applies to the long run and will not materialize fully in the first years after accession. We calculate these effects for the ten countries that have entered the EU in 2004, and for the candidate members: Bulgaria, Rumania and Turkey. The results are presented in Table 4.1 and Table 4.2.

To calculate the effect on trade we use the results in the third column of Table 2.1. In this specification a measure for institutional quality is included, lowering the estimated direct effect of EU membership on trade. Membership has a direct effect as well as an indirect effect, when it forces entrants to adjust their institutions towards the average EU level. The coefficient for the EU dummy is 0.38 and the coefficients for the level of institutions in the exporting and importing country are 0.225 and 0.243, respectively.

The first three columns in Table 4.1 show the situation before the accession. The first column provides a country's trade share within the EU28 and the second a country's ratio of trade (sum of exports and imports) to GDP. Clear is that the geographical position within the EU28 matters for a country's trade with the other (candidate) member states. For example, the Baltic states are at the periphery of the EU and their trade with other member states is relatively low. Clear is also that a large country like Poland is less open than a small country like Malta. The third column shows the measure for institutional quality. According to the Heritage index, the average level in the EU15 is equal to 2.2 in the year 2000. Note that a higher value corresponds with less institutional quality. The Czech republic and Estonia are the two countries that have already reached that level. The others have a lower quality of institutions according to the Heritage index and are assumed to see an improvement in the quality as a part of EU membership. This assumption is to illustrate the consequences of such an improvement. It is not necessarily realistic. The dispersion within the EU15 is large, ranging from 2.7 in Greece to 1.7 in Ireland. It can take decades before countries reach that level of institutional quality. Institutions are often rooted in the country-specific culture and cultural differences might be structural.

The last three columns present the effect of EU membership on a country's trade. The fourth column gives the direct effect. It is the product of three terms: the coefficient of the EU dummy in the gravity equation, the share of trade with the EU28 and the ratio of total trade to GDP. For example, for the Czech Republic the direct effect is an increase of 49.4% ($=(e^{0.38} - 1)*123.8*86.3/100$). The fifth column shows the indirect effect on a country's trade when the quality of its institutions converges towards the average level in the EU15. For some countries, like Malta and Slovakia, the indirect effect is at least as important as the direct effect.

Overall, EU membership is calculated to raise trade of the 10 countries with 55.6% and trade of the 13 countries with 49.5%. The direct trade effect is larger than the indirect effect

through institutions, but for the three candidate countries the indirect effects are relatively more important.

There are important differences among the countries. While for the Malta the potential increase in its openness is more than 120%, Poland is implied to see an increase of about 40%, and Turkey is calculated to see an increase with only 30%. A small country like Malta is much more open than a large country like Poland or Turkey. The small country can expect a larger absolute change in openness than the large country, but the relative change for both small and large countries is roughly the same.

Table 4.1 Effect of the EU Membership on Openness

	Initial situation			Change in openness as result of EU membership		
Country	EU28 trade (% of total)	Total trade (% of GDP)	Heritage index for institutions	Direct effect on openness	Via institutions on openness	Total effect on openness
	(1)	(2)	(3)	(4)	(5)	(6=4+5)
Cyprus	56.0	99.5	2.55	25.8	17.0	42.7
Czech Republic	86.3	123.8	2.20	49.4	0.0	49.4
Estonia	77.4	164.7	2.20	58.9	0.0	58.9
Hungary	80.6	101.8	2.55	37.9	17.4	55.3
Latvia	67.2	106.9	2.65	33.2	23.7	56.9
Lithuania	68.6	105.8	2.90	33.5	37.6	71.2
Malta	62.5	182.5	2.95	52.7	70.0	122.7
Poland	80.8	59.0	2.80	22.0	17.8	39.8
Slovakia	85.6	131.8	3.00	52.1	54.2	106.4
Slovenia	82.4	114.8	3.00	43.7	47.2	90.9
Accession 10: weighted average	79.8	91.7	2.68	33.8	21.8	55.6
Bulgaria	71.7	110.9	3.40	36.7	71.9	108.6
Romania	77.9	64.4	3.30	23.2	37.8	61.0
Turkey	66.1	52.3	2.75	16.0	14.4	30.3
Accession 13: weighted average	75.4	77.0	2.79	26.8	22.7	49.5

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 ratio of GDP 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 similar calculations on basis of the regression results in the fifth column of Table 2.1 in which the effect of EU membership depends in a non-linear way on openness. The conclusion is that relatively open, small countries benefit to a larger extent from membership than relatively closed, large countries. The average effect for the ten new EU members remains the same. The variation across the countries is, however, much larger and reflects the large

variation in openness. The trade effects of EU membership for the candidate countries are on average smaller because these countries are not as open as the ten new member states.[13]

After taking the step to calculate the implied effect of EU membership on trade, the next step is to derive from the income (growth) regression the implied effect on GDP in the new and candidate member states. Table 4.2 presents the results using the estimation results in the third column of Table 3.1. In this specification EU membership can contribute to income by increasing openness and by improving institutional quality (to the average in the EU15). Indeed, the direct effect is insignificant; only the indirect effects, through trade expansion and through institutional change, seem to matter. Note that the effect of more openness depends on the level of openness itself: this effect is non-linear. Comparing the first two columns in Table 4.2 makes that clear. The first column reproduces the effect of EU membership on openness (= column (6) in table 4.1) , whereas the second column presents the effect of openness on income. The Czech Republic and Slovakia illustrate that for countries with similar initial trade patterns, see columns (1) and (2) in Table 4.1, more openness is usually associated with more income. Since the trade effect for Slovakia is twice as large as for the Czech Republic, the income effect is also larger. The income effect, however, is not twice as large (the non linearity). The case of the small and extremely open economy of Malta shows, however, that the income effect of more openness is sometimes small. The effect of openness on income is non-linear and becomes negligible for high values of openness. Indeed, Malta's openness (180%) deviates strongly from the average in the sample (69%). The case of Malta thus underlines that small countries may not expect a (much) larger trade-related bonus than large countries. For most of the accession countries the trade-related income effects have the same order of magnitude.

Comparing the results in columns 2 and 3 reveals that the effect through trade is much more important than the direct effect through institutional change on income. This must not be taken to mean that institutional change is unimportant. The regressions imply that improvements in domestic institutions have important income effects, but also that these improvements work (to raise income) through an increase in exports and imports.
On average, the income in the ten new member states is calculated to increase with 39% in the long-run. From the candidate countries, especially, Bulgaria and Romania are projected to benefit. The outcome is thus a significant effect of EU membership on domestic GDP. It indicates that CGE analyses underestimate the (dynamic) effects of economic integration. The GDP effect is in our calculations about five times larger than the largest effect from the static CGE analyses. The outcome also indicates that EU integration could really help the CEE countries to catch up to the average level in the EU. For the 10 accession countries relative income is 45% of the average in the EU15 (World Bank, 2003). That could increase to about

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

63%. This is a substantial catching-up effect, though not enough to close the income gap between new and old member states completely.[14]

Table 4.2 Effect of EU membership on income (change in GDP as % of initial GDP)

Country	Effect on openness (see Table 4.1)	Effect of openness on income	Effect of institutions on income	Total effect on income
Cyprus	42.7	28.6	1.1	29.1
Czech Republic	49.4	26.2	0.0	26.2
Estonia	58.9	18.0	0.0	18.0
Hungary	55.3	34.6	1.1	35.7
Latvia	56.9	34.0	1.4	35.3
Lithuania	71.2	40.3	2.1	42.5
Malta	122.7	7.2	2.3	9.5
Poland	39.8	34.9	1.8	36.7
Slovakia	106.4	37.3	2.4	39.7
Slovenia	90.9	43.0	2.4	45.4
Average for accession 10:	55.6	37.5	1.5	39.0
Bulgaria	108.6	48.7	3.7	52.4
Romania	61.0	48.6	3.4	52.0
Turkey	30.3	28.3	1.7	30.0
Average for accession 13:	49.5	37.8	1.8	39.6

The income effect of 37.5% due to a trade increase of 56% implies that the long-run effect of 1% point extra openness on income is about 0.7. This is smaller than the estimated effect in section 3 of about 1.0% for the average openness of the countries in the sample. The reason is that the relation between openness and income growth is nonlinear: the average openness of the ten new member states is some 20 percentage points higher than the one of the total sample.

Discussion

Combining the two regression equations produces the result that accession is expected to have an important effect on production and income in the new member states. The implied, estimated increase in income is about 39%, which is much larger than the predicted increase by general equilibrium models. The question is whether the estimated increase in income is plausible and robust?

One point of doubt is that the regression equations do not identify structural relations. The causality may run in either direction. For example, better possibilities to trade may lead to an

[14] 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.

increase in income but, on the other hand, a higher income may allow governments to reduce barriers to trade. However, the results from structural estimation seem to imply even larger effects from trade on income (Frankel and Romer, 1999). This suggests that the regressions in this paper underestimate, rather than overestimate, the income effect through international trade.

Perhaps the uncertainty about the effects of EU membership is not so much that it increases income but how it increases income. In the literature there is a debate about the relative significance of three broad factors behind economic performance: trade, location and institutions. Unfortunately, identifying the structural relations between economic performance and either of these factors is not easy, to put it mildly. Finding good instruments is rather difficult. As a result, the debate does not seem to converge to a consensus.

Accepting that is it is difficult to tell whether lower barriers to trade or a better quality of institutions are behind the economic benefits from EU membership, we want to argue that the implied total effect in income in the new member states is plausible. There are two pieces of relevant evidence. First, we consider the economic performance of Greece, Portugal and Spain after their entry in the Union. Second, we consider the implications from regression equation that links total factor productivity (TFP) to expenditure on research and development (R&D).

First, Table 4.3 shows the income per capita in Greece, Portugal and Spain in 1986 and in 2001, relative to the average for the EU-15. Since its accession (in 1981) Greece has not succeeded in increasing its relative income. In fact, between 1986 and 1995 its relative income has even declined to 65%. The experience for Portugal and Spain is more encouraging. They have been able to raise their relative income with about 10 to 14 percentage points in the 15 years after accession. Although it is not clear that the increase in period 1986- 2001 represents already the long-term effect, the numbers suggest that accession contributes significantly to catching up. One has to keep in mind that at the accession date both countries were much closer to the EU-15 average than the newest member states.

Table 4.3 Catching-up of other EU countries

Income per capita as % of EU-15 in ppp terms	1986	2001	Relative increase 1986-2001
Greece	74.6	72.4	– 2.9%
Spain	74.2	83.6	12.7%
Portugal	61.5	75.3	22.4%

Source: World Bank (2003), and own calculations.

Second, what is the effect of trade on total factor productivity? Coe and Helpman (1995), and Coe, Helpman, and Hofmaister (1997) find empirical evidence for the familiar idea that trade in goods and services helps the exchange of ideas and technologies leading to improvements in productivity. In the regressions the stock of foreign knowledge investment (i.e. expenditure on R&D) has an effect on domestic TFP. This effect also depends on openness; the more open an economy is, the more it benefits from the stock of foreign knowledge. We have taken the estimation results from Coe *et al*. (1997) to calculate the implied effect of trade on TFP: for the thirteen new and candidate member states, the 49.5% increase in openness leads to a TFP increase of 7.5%. The effect on production is larger than the effect on TFP. The reason is that the capital stock will adjust. With a constant rate of return on capital the capital stock will grow at the same rate as production. This assumption and a capital share in total costs of 1/3 imply that the effect on production is a factor one and a half larger than the effect on TFP. Assuming a larger capital share gives larger factor. Mankiw, Romer and Weil (1992) find that the observed pace of convergence implies a capital share of 2/3 (including human capital), leading to a factor three. In the latter case, production increases by about 20% (3*7.5%) due to the trade-related R&D spillovers. This explains about 50% of income growth in the new and candidate member states. With either factor, the effect on production through the combination of R&D and openness is substantial. However, even with a factor three, the effect is not as large as the implied effect of our estimations. But this is not surprising. R&D is only a part of the story. Catching up also takes place through other channels such as imitation and foreign direct investment.

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 34% to 56%. 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 0.7% higher income in the long run given the openness of the new member states. Combining the two results we calculate that the new member states can on average count on an improvement of their incomes to 39% 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. However the size of these effects is not a reason for celebration. In 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. Our assessment shows that these dynamic effects are essential in evaluating the macro-economic effects of EU accession.

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Appendix A: Additional Results

Effect of openness on GDP per capita (various measures of institutional quality

Heritage indicators	Money	Fdi	Finance	Property	Regulation	Bm
Openness	0.055*	0.061**	0.061**	0.060**	0.070**	0.061
	[1.830]	[2.040]	[2.050]	[2.060]	[2.490]	[2.110]*
Openness^2	– 0.009	– 0.010	– 0.011	– 0.012	– 0.019**	– 0.012
	[– 0.910]	[– 1.090]	[– 1.120]	[– 1.271]	[– 2.294]	[– 1.346]
Institutions	– 0.013***	-0.003	– 0.010	– 0.026*	– 0.043***	– 0.025***
	[– 2.948]	[– 0.438]	[– 1.614]	[– 3.523]	[– 5.351]	[– 4.472]
R-squared	0.987	0.987	0.987	0.987	0.987	0.987
Kaufman indicators	voice	stability	effective	regquality	law	corrupt
Openness	0.070**	0.061**	0.073**	0.075***	0.072**	0.084***
	[2.290]	[2.080]	[2.540]	[2.590]	[2.490]	[2.880]
Openness^2	– 0.010	– 0.011	– 0.018**	– 0.018**	– 0.015*	– 0.018**
	[– 1.054]	[– 1.160]	[– 2.015]	[– 1.991]	[– 1.651]	[– 2.020]
Institutions	0.028**	0.033***	0.062***	0.053***	0.057***	0.048***
	[2.458]	[4.051]	[7.279]	[5.005]	[6.593]	[6.046]
R-squared	0.987	0.987	0.988	0.987	0.988	0.987

Notes: Dependent variable: Log Real GDP/capita. Additional Independent variables: log population; log initial GDP/capita, investment/GDP ratio. population growth, enrolments rates primary and secondary schooling, constant.

Heteroskedasticity robust student t values are reported between square brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% 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.

Numbers of observations is 720, 96 countries are included.

Heritage and Kaufman indicators

Heritage indicators	Kaufman indicators
Money – Monetary policy	Voice – Voice and Accountability
Fdi – Foreign Direct Investment	Stability – Political Stability
Finance – Banking and Finance	Effective – Government Effectiveness
Property – Property Rights	Regquality – Regulatory Quality
Regulation – Regulation	Law – Rule of Law
Bm – Black Market	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 institutional 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 institutional quality 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)	Saudi Arabia (r)	Togo (r)
Pakistan (r)	Senegal (r)	Trinidad and Tobago (r)
Panama (r)	Seychelles (r)	Tunisia (r)
Papua New Guinea (r)	Sierra Leone (r)	Turkey (r)
Paraguay (r)	Singapore (r)	Turkmenistan
Peru (r)	Slovenia	Uganda (r)
Philippines (r)	South Africa (r)	Ukraine
Poland (r)	Spain (r)	United Kingdom (r)
Portugal (r)	Sri Lanka (r)	United States (r)
Qatar (r)	Sudan (r)	Uruguay (r)
Russia	Sweden (r)	Uzbekistan
Rwanda (r)	Switzerland (r)	Venezuela (r)
Saint Kitts and Nevis (r)	Syria (r)	Viet Nam (r)
Saint Lucia (r)	Taiwan	Yemen (r)
Saint Vincent and the	Tajikistan	Zambia (r)
Grenadines (r)	Tanzania (r)	Zimbabwe (r)
Sao Tome and Principe	Thailand (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	Ireland	Portugal
Canada	Italy	Spain
Denmark	Japan	Sweden
Finland	Korea. Republic of	Switzerland
France	Mexico (LAC)	Turkey
Germany	Netherlands	United Kingdom
Greece	New Zealand	USA
Hungary	Norway	
Iceland	Poland	

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