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### EU accession and income growth

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## EU Accession and Income Growth: An Empirical Approach

Arjan M. Lejour · Vladimir Solanic · Paul J. G. Tang

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**Abstract** 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 27%. EU membership may contribute to trade by inducing countries to improve the quality of their institutions. Trade increases by another 23% if institutions improve, yielding a total trade increase of 50%. Improved openness increases income by 38% according to our estimates. Adding a small direct effect of improved institutions on income, the total income effect of EU membership is 40% for the 12 new members and Turkey. 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.

**Keywords** Income and openness · EU accession · Gravity equation · Bilateral trade

**JEL Classification** F15 · F43

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## Introduction<sup>1</sup>

In May 2004, eight countries from Central and Eastern Europe (CEE), along with Cyprus and Malta, joined the European Union. In January 2007, Bulgaria and Romania followed. 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 ten 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 hope that EU membership will pave the way towards economic prosperity. In 2001, income per capita in the twelve new member states and Turkey about 34% 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. 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. 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).

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<sup>1</sup> We gratefully acknowledge comments by George Gelauff, Volker Nitsch and Theo van de Klundert.

Studies in the first category simulate models to calculate the effects of removing trade barriers between the national goods and services markets. 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. Breuss (2001) and Lejour et al. (2004) predict an average income effect for Central and Eastern Europe that is more than 7% of GDP. This effect is notable, but clearly not enough to close the income gap between new and old member states. The model simulations 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) (see e.g. Coe and Helpman 1995; Griffith et al. 2000).

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 five 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 0.6–0.8% 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. Crespo-Cuaresma et al. (2002) argue that the duration of EU membership has a positive effect on GDP growth per capita. Crafts and Kaiser (2004) stress 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 can be about 4% in the medium term, if they move to EU standards of good governance.

In this article, 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 (see e.g. Hall and Jones 1999; Knack and Keefer 1995; Acemoglu et al. 2001; Easterly and Levine 2003; Kaufmann and Kraay 2003). Rodrik and Subramanian (2003) even claim that institutions trump everything else in explaining growth. Empirical work also finds a strong relation between the institutional quality and trade flows (see Koukhartchouk and Maurel 2003; de Groot et al. (2004; Jansen and Nordas 2004). 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 50%. 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 1% 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 40% 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 and Turkey could increase from 34 to 47% 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 article is structured as follows. Section 3 provides estimations results for the relation between EU membership on openness. In Sect. 4, we quantify impacts of openness on income. In Sect. 5, we combine the two regression results and estimate effect of accessing the EU on output for all the accession countries. Section 6 concludes.

## 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

$$\log(X_{ij}) = \beta_0 + \beta_1 \log(Y_i) + \beta_2 \log(Y_j) + \beta_3 \log\left(\frac{Y_i}{N_i}\right) + \beta_4 \log\left(\frac{Y_j}{N_j}\right) + \delta_1 \log(D_{ij}) + \dots + u_{ij}, \quad (1)$$

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 45,712 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 Lejour et al. (2006). 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% of the variation in the data. The first column of Table 1 (Eq. 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.<sup>2</sup> 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% decrease in distance leads roughly to a 8.2% 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.<sup>3</sup>

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 (Eq. 2).<sup>4</sup> 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 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 1 shows 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 (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

<sup>2</sup> 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 handside of Eq. 1. Then the values of coefficients for both GDP's are nearly identical.

<sup>3</sup> 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.

<sup>4</sup> Since membership of the APEC and the OECD overlaps considerably, the two dummies are introduced separately into the equation.

**Table 1** The effect of the EU membership on bilateral trade flows

Regression	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-21.655*** [-133.0]	-22.862*** [-136.4]	-18.950*** [-78.4]	-19.867*** [-133.1]	-21.702*** [-133.1]	-19.020*** [-78.5]
EU dummy	0.527*** [20.5]	0.398*** [15.0]	0.380*** [14.3]	0.246*** [9.0]	0.037 [0.7]	-0.078 [-1.5]
EU* openness					0.006*** [10.8]	0.006*** [9.8]
APEC	1.251*** [40.1]		1.166*** [36.4]		1.177*** [24.5]	1.125*** [23.1]
APEC* openness				0.001* [1.8]		0.001 [1.0]
OECD (excluding EU)		0.086** [2.2]		0.064 [1.5]		
Log GDP exporter	-0.165*** [-38.2]	-0.135*** [-29.9]	-0.146*** [-30.9]	-0.116*** [-23.5]	-0.161*** [-37.2]	-0.143*** [-30.1]
Log GDP importer	0.776*** [172.3]	0.807*** [176.9]	0.793*** [166.1]	0.826*** [170.9]	0.775*** [172.2]	0.793*** [166.0]
Log GDP per capita exporter	0.504*** [59.0]	0.514*** [58.4]	0.405*** [32.8]	0.403*** [30.9]	0.501*** [58.5]	0.404*** [32.7]
Log GDP per capita importer	0.499*** [58.3]	0.505*** [56.8]	0.392*** [32.0]	0.390*** [30.4]	0.500*** [58.4]	0.393*** [32.1]
Log distance	-0.814*** [-98.2]	-0.816*** [-95.3]	-0.837*** [-96.1]	-0.841*** [-93.0]	-0.812*** [-97.8]	-0.835*** [-95.6]
Common border	0.595*** [17.2]	0.583*** [16.4]	0.591*** [16.7]	0.582*** [16.0]	0.604*** [17.4]	0.599*** [17.0]
Common language	0.854*** [36.5]	0.938*** [40.3]	0.756*** [30.7]	0.828*** [33.8]	0.852*** [36.2]	0.754*** [30.5]
Institutional quality exporter			-0.225*** [-14.5]	-0.249*** [-14.7]		-0.221*** [-14.3]
Institutional quality importer			-0.243*** [-13.9]	-0.261*** [-13.9]		-0.243*** [-14.0]
Weighted R <sup>2</sup>	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. The sample spans the period 1996–2000. Year dummies are included and statistically significant at the 1% level but not reported

\*, \*\*, \*\*\* Statistical significance at the 10%, 5% and 1% level



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.

## 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.<sup>5</sup>

Various aspects of the empirical approach to trade and growth have generated discussion in the literature. Rodríguez and Rodrik (2000) 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

<sup>5</sup> Good surveys are Dollar (1992), Edwards (1993) and Srinivasan and Wallack (2004).

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 article 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 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 et al. (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, that 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 5-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 5-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 2 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.

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 1% point increase in openness leads<sup>6</sup> 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 1% point. Note that these effects are substantially lower than the coefficient of 2 found by Frankel and Romer (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 2 underlines that institutions do indeed matter for economic performance of countries.<sup>7</sup> 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

<sup>6</sup> For an average value for openness of 69.1%.

<sup>7</sup> 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.

**Table 2** Effect of openness and EU membership on GDP per capita

Regression	(1)	(2)	(3)	(4)
Openness	0.060** [2.01]	0.059* [1.95]	0.070** [2.41]	0.036 [1.21]
Openness <sup>2</sup>	-0.010 [-1.02]	-0.009 [-0.99]	-0.016* [-1.76]	-0.003 [-0.30]
Population (log)	0.007* [1.92]	0.007* [1.83]	0.008** [2.36]	0.002 [0.67]
Initial income (log)	0.954*** [105.10]	0.953*** [104.02]	0.944*** [100.49]	0.933*** [82.44]
Investment rate (log)	0.007*** [9.47]	0.007*** [9.42]	0.007*** [9.49]	0.005*** [6.90]
Population growth	-0.460 [-0.50]	-0.446 [-0.47]	-0.304 [-0.34]	0.091 [0.10]
Enrolment primary education	0.000 [1.30]	0.000 [1.30]	0.000 [0.72]	0.001** [2.22]
Enrolment secondary education	0.001** [2.04]	0.001** [2.01]	0.001 [1.41]	0.001** [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** [2.37]	0.236** [2.38]	0.401 [3.73]	0.504 [4.58]
R <sup>2</sup>	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 to 2000. Initial GDP per capita refers to GDP per capita at the beginning of each 5-year period. Heteroskedasticity robust student *t* values are reported between square brackets

\*, \*\*, \*\*\* Statistical significance at the 10, 5 and 1% level

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 Kaufmann and Kraay (2003) and found that indeed the coefficients remain statistically significant from zero and keep more or less the same value (see Lejour et al. 2006).

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 et al. (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 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.<sup>8</sup> 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.

### **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 Tables 3 and 4.

To calculate the effect on trade we use the results in the third column of Table 1. In this specification a measure for institutional quality is included, lowering the

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<sup>8</sup> The coefficients for the high income countries are generally lower than for other country groups (with an exception of lower-middle income countries).

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 3 show the situation before the accession. The first column provides a country's trade share within the EU28 (EU27 plus Turkey) 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

**Table 3** Effect of the EU membership on openness

Country	Initial situation			Change in openness as result of EU membership		
	EU28 trade (% of total) (1)	Total trade (% of GDP) (2)	Heritage index for institutions (3)	Direct effect on openness (4)	Via institutions on openness (5)	Total effect on openness (6 = 4+5)
Bulgaria	71.7	110.9	3.40	36.7	71.9	108.6
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
Romania	77.9	64.4	3.30	23.2	37.8	61.0
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
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

**Table 4** Effect of EU membership on income (change in GDP as % of initial GDP)

Country	Effect on openness (see Table 3)	Effect of openness on income	Effect of institutions on income	Total effect on income
Bulgaria	108.6	48.7	3.7	52.4
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
Romania	61.0	48.6	3.4	52.0
Slovakia	106.4	37.3	2.4	39.7
Slovenia	90.9	43.0	2.4	45.4
Turkey	30.3	28.3	1.7	30.0
Average for accession 13	49.5	37.8	1.8	39.6

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% ( $= (e^{0.38} - 1) \times 123.8 \times 86.3/100$ ). 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. We have done similar calculations on basis of the regression results in the fifth column of Table 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.<sup>9</sup>

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 presents the results using the estimation results in the third column of Table 2. 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 makes that clear. The first column reproduces the effect of EU membership on openness (=column (6) in Table 3), 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 3, 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 twelve new member states is calculated to increase with 39% in the long-run. 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 12 accession countries and Turkey relative income is 34% of the average in the EU15 (World Bank 2003). That could

<sup>9</sup> These results are available upon request by the authors.



increase to about 48%. This is a substantial catching-up effect, though not enough to close the income gap between new and old member states completely.<sup>10</sup> The income effect of 37.5% due to a trade increase of 50% 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 Sect. 4 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% points higher than the one of the total sample.

## Conclusions

In the present article, we have quantified potential impacts—both static and dynamic—of the EU membership on the new members and candidate member Turkey. We find that joining the EU can increase the trade up from 27 to 50%. 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% 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 40% 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 2001, where the income of the new member states is about 34% 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, Bulgaria and Rumania and is also true for candidate member Turkey.

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<sup>10</sup> 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. Probably prices will converge somewhat to the average EU price level if GDP increases. This will reduce the relative increase in income per capita somewhat.

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