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Enlarging the EMU to the East

What Effects on Trade?

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Abstract

The purpose of this paper is to assess the implications of the Economic and Monetary Union (EMU) accession of eight Central and Eastern European Countries (CEECs) on their share in EMU-12 imports. Overcoming biases related to endogeneity, omitted variables and sample selection, our results indicate that the common currency has boosted intra-EMU imports by 7%. Under the assumption that the same relationship between the explanatory variables and imports will hold for EMU-CEEC trade, we are able to predict the future impact of the euro. Our findings suggest that except for the least integrated countries, Poland, Latvia and Lithuania, all CEECs can expect increases in the EMU-12 import share.

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I MOTIVATION

As a result of the European Commission's convergence report in May 2006, Slovenia was the first of the new European Union (EU) member states to adopt the euro. Other countries will follow in the course of the upcoming years. While research on exchange rate regimes traditionally focused on its consequences for the macroeconomic performance of countries (see Ghosh, Gulde and Wolf, 2002 for an exhaustive overview), a more recent line of research draws attention to the real impacts of exchange rate issues (e.g. Bayoumi and Eichengreen, 1992 and 1998 and Frankel and Rose, 1998 for the effects on business cycle synchronization and Belke and Gros, 2002 and Belke and Setzer, 2003 for labour market effects). In a controversial but highly influential paper, Rose (2000) assessed the contribution of currency unions in promoting international trade. His point estimate of a 3.35 times higher trade volume with a common currency compared to the baseline scenario without a common currency has been subject to much critique. In a recent paper, Baldwin (2006) summarizes follow-up studies and specifically points his critique to possible estimation biases related to omitted variables, endogeneity and sample selection.

Among the numerous papers trying to reduce the "Rose effect", only few dealt explicitly with the euro area. The first studies by Micco, Stein and Ordoñez (2002) and Flam and Nordstrom (2003) estimate respectively 6% and 8% more trade among Economic and Monetary Union (EMU) members compared to other EU member states. Controlling for the general trend of greater economic integration among the euro area countries over the past five decades, Berger and Nitsch (2005) find the EMU effect even disappearing completely.

However, there are very few authors that point to the trade effects of the forthcoming EMU enlargement.[1] While trade barriers between the old and new EU member states had already been removed during the 1990s, sharing a common currency may further deepen real economic integration. Empirical findings on intra-EMU trade effects of the introduction of the euro by the Central and Eastern European Countries (CEECs)[2] are of high interest for politicians and for researchers in the field of Optimum Currency Areas (OCAs) at least for two reasons: First, they may have important policy implications. If a common currency boosts trade even among highly integrated regions, currency unions become more attractive, and hence, European Central Bank (ECB) and government authorities may encourage applicants to execute all necessary steps for an early adoption of the euro. Second, any increase in euro area trade resulting from an EMU enlargement provides empirical support for Rose's finding that establishing a common currency stimulates trade among union members substantially.

We start this study by applying a specification that accounts for recent insights into the theoretical foundation as well as the appropriate econometric set-up of gravity models. While earlier studies only used time-invariant country pair fixed effects to address the price terms, as emphasized by Anderson and van Wincoop (2003), we correct for the remaining omitted variable bias by also incorporating time-variant multilateral resistance to trade. As suggested by Egger (2002) and Carrère (2006), we apply the Hausman-Taylor (HT) instrumental variables estimator to account for any possible endogeneity of Right Hand Side (RHS) variables, and specifically the EMU dummy. Further, we use the Fixed Effects Vector Decomposition (FEVD) estimator developed by Plümper and Troeger (2007), which has – to our knowledge – never been applied before in the context of gravity modelling. Both techniques have the great advantage of allowing for an estimation of the traditional time-invariant gravity variables, such as distance and language while controlling for the unobserved individual effects in an efficient way.

Based on our estimates of the early impact of the euro on intra-EMU imports, we aim to assess the implications of the EMU accession of eight CEECs on their share in the twelve current EMU member states' imports as of end-of-year 2004. Assuming that the same relationship between income, distance, common borders and other country characteristics and bilateral trade will hold for future EMU member states, we calculate the potential import increases following the accession of the CEECs to the euro area. Our predictions based on the parameters estimated out-of-sample suggest that except for the least integrated countries Poland, Latvia and Lithuania, all CEECs can expect further gains in the EMU-12 import share once they adopt the euro.

After developing some stylized facts in section 2, we continue elucidating the specification of the gravity equation we are going to test (section 3). The description of the applied econometric methods and the data set (section 4) is followed by the interpretation of the estimation results in section 5. Section 6 contains a summary as well as policy implications of the obtained results.

II DEVELOPMENT OF TRADE FLOWS: STYLIZED FACTS

We start with some stylized facts concerning trade flows between the euro area and the Central and Eastern European EU member countries. For this purpose, Figure 1 plots the EMU-12 and the EU-15 imports from the CEECs between 1991 and 2004. The figure conveys

first empirical evidence of a parallel increase in the import values of the EU-15 and the EMU-12 from the CEECs over the past 15 years.[3]

Figure 1 about here

While there has been a steady rise in the import value over the 1990s, one can observe a higher growth rate imminently prior to the EU accession of the eight CEECs. Even though all obstacles to free trade have been fully removed, sharing a single currency may stimulate real integration further by reducing the transaction costs involved in trade.

A simple calculation helps to portray the relative change in intra-EMU trade and intra-EU trade. To render the sizes of the two geographical regions comparable, the respective yearly import values have been normalized with regard to the base year (1997). Taking the quotient allows then to assess relative changes. To be precise, the development of intra-EMU imports (M_{EMU}) and intra-EU imports (M_{EU}) since 1997 has been calculated as follows:

$$\frac{M_{EMUt} / M_{EMU97}}{M_{EUt} / M_{EU97}} \tag{1}$$

Looking at Figure 2, it can be readily seen that the increase of intra-EMU imports has been over 5% higher than the rise of intra-EU imports during the same period. After an initial slowdown in 1999, the EMU experienced an especially strong relative increment in 2001, when Greece entered the currency union, and in 2003. The graph also suggests an announcement effect, since intra-EMU imports already increased relative to intra-EU imports in the two years before the formal adoption of the common currency.

Figure 2 about here

The crude figure seems to roughly confirm prior studies which provide estimates mostly in the range of 5 to 10% (Baldwin, 2006). However, the graph also shows that it is crucial to include the most recent year available, since much of the increase in imports only occurred since 2002.

Based on the euro area imports over the CEECs' GDP ratio, Figure 3 gives a visual impression of the degree of euro area openness of the CEECs in the year 2004. According to the standard textbook version of OCA theory, an already high degree of economic integration

among prospective members of a currency bloc promises higher efficiency gains and lower stability losses from adopting a common currency.[4] Thus, Figure 3 suggests that the Czech Republic, Slovakia and Hungary should benefit most from their individual EMU accession since the euro area displays a high trade exposure towards them. However, the seminal study by Frankel and Rose (1998) challenged the OCA textbook view by stressing the possibility of endogenous currency unions. They argue that two countries would move even closer to match the OCA criteria once they share a common currency. Consequently, it seems equally apt to argue a priori that the rise of imports due to the euro adoption is expected to be higher for countries that have not yet exploited their full trade potential with the current EMU member states. Based on this different variant of OCA theory, Figure 3 indicates that Latvia, Lithuania and Poland were in 2004 relatively less open towards trading with the EMU-12 and may therefore expect a bigger trade effect from the euro. Which view is correct, is a purely empirical question. We leave the answer to our econometric investigation.

Figure 3 about here

Seen on the whole, the stylized facts match our a priori expectations well. While the imports of the EU-15 and the euro area from the CEECs have developed synchronously up to now, those EU member states that share a common currency seem to trade relatively more with each other than with Denmark, Sweden and the UK. This result at the outset argues in favour of a similar development in case of the EMU accession of the CEECs, thus calling for a more formal investigation.

III EMPIRICAL SPECIFICATION

We estimate a log-linearised reduced-form gravity equation of the form

$$\ln M_{ijt} = \zeta + \eta_1 \ln Y_{it} + \eta_2 \ln Y_{jt} + \eta_3 \ln re_{ijt} + \eta_4 \ln d_{ij} + \eta_5 Z_{ij} + \eta_6 EMU_{ijt}$$
$$+ \eta_7 \ln avre_{ijt} + \eta_8 \ln avd_{ij} + \eta_9 avZ_{ij} + \eta_{10} avEMU_{ijt} + \kappa_{ijt} \tag{2}$$

where Y_{it} is the importer's GDP influencing its import demand, Y_{jt} is the exporter's GDP influencing its export supply[5], re_{ijt} stands for the real exchange rate[6] and d_{ij} is the great-

circle distance between the importing and the exporting country.[7] Z_{ij} represents a set of dummy variables serving as proxies for country i's trade costs. To be precise, we consider whether country i or j are landlocked (ll) and whether they share a common border (border) or language (cl) as factors hampering or facilitating trade. Finally, EMU_{ijt} represents a dummy variable measuring Mundell's proposal of a single medium of exchange reducing transaction costs and thereby facilitating international trade (Mundell, 1961). The variable takes the value of 1 for both countries of a trading pair being EMU members and 0 otherwise. We set this variable in the first set of regressions (Table 1) – accounting also for a possible announcement effect – over the period 1998-2004. In the second set of regressions (Table 2), we introduce yearly EMU dummies to see in which years the common currency impact has been strongest.

As stated by Anderson and van Wincoop (2003), bilateral trade does not solely depend on bilateral trade costs, but also on the average resistance to trade with the Rest of the World (ROW). To account for this finding, we introduce the correspondent multilateral term to all variables that facilitate or hamper bilateral trade. To be precise, multilateral resistance (MR) is given by the sum of average bilateral resistances (BR) of countries i (j) towards all trading partners except for the specific trading partner j (i).[8]

$$MR_{ij(t)} \mid \frac{1}{N \, 4 \, 1} \sum_{k \mid 1,k \prod j}^{N} BR_{ij(t)} \, 2 \, \frac{1}{M \, 4 \, 1} \sum_{l \mid 1,l \prod i}^{M} BR_{ji(t)} \qquad (3)$$

Since the $avEMU_{ijt}$ variable is supposed to capture the trade effects of the common currency on outside countries, it is set to 0 for all EMU member states.[9] The parameter coefficients of the multilateral trade cost variables are expected to take the opposite sign of their bilateral counterparts. Hence, the bigger a trading pair's joint resistance to trade with the ROW, the lower the bilateral trade costs relative to the multilateral trade costs and the larger country i's imports from country j. For the $avre_{ijt}$ this means, that holding the bilateral real exchange rate between country i and country j constant, a depreciation of country i's currency with respect to all other currencies in the sample, pushes country i to import from country j. Since a part of the multilateral variables does not only change cross-sectionally but also over time (e.g. the average exchange rate), we are able to remove biases present in studies that only include country (pair) fixed effects to describe Anderson and van Wincoop's (2003) price terms. To summarize, the expected coefficient signs are

$$\eta_1 \} 0, \eta_2 \} 0, \eta_3 \{ 0, \eta_4 \{ 0, \eta_5 \mid \frac{Z}{z\mid 1} \vartheta_1 \{ 0, \vartheta_2 \} 0, \vartheta_3 \} 0, \eta_6 \} 0, \eta_7 \} 0, \eta_8 \} 0,$$

$$\eta_9 \mid \frac{avZ}{avZ \mid 1} \vartheta_4 \} 0, \vartheta_5 \{ 0, \vartheta_6 \{ 0, \eta_{10} \{ 0.$$

Finally, we overcome a possible selection bias by including three variables that approximate the Heckman correction term: HC1 is a variable containing the number of years of a trading pair in the sample. HC2 and HC3 are dummies, taking the value of 1 if the trading pair is observed over the entire period 1991 to 2004 and if the trading pair is present in the sample in t-1, respectively (and 0 otherwise). By this, we leave ample room within the estimation for the basic insight that a great number of bilateral trade relationships are not utilized, meaning that they involve no trade (the so-called extensive margin of trade, Felbermayr and Kohler, 2007).

IV ECONOMETRIC METHODOLOGY AND DATA

4.1 General remarks

The estimations are based on a panel data set containing all countries being members of the Organisation for Economic Co-operation and Development (OECD) over the period 1991 to 2004 – including also those CEECs which have already joined (Hungary, Poland, the Czech Republic and Slovakia) – plus Romania and Bulgaria and the four CEECs (Estonia, Latvia, Lithuania and Slovenia) that have not yet become full OECD members.

The advantages of using panel data in the context of this study are straightforward. They allow capturing relevant relationships between variables over time and monitoring unobservable country pair individual effects. Cheng and Wall (2004) demonstrate that not controlling for country pair heterogeneity yields biased estimates. The country pair effects will be treated as fixed, since the Random Effects (RE) model only yields consistent estimates when the unobservable bilateral effects are not correlated with the error term. The conducted Hausman test, however, rejected the null-hypothesis of no correlation. The relevant Fixed Effects (FE) regression thus gives unbiased estimates of the time-varying variables (reported in column 2 of Table 1 and 2). The first drawback of this procedure is well-known: Since the within-groups estimator ignores the between-groups variance, estimates for the time-invariant explanatory variables cannot be provided. Only very recently, researchers have started discussing a second drawback: Although coefficients are provided for variables that are

hardly changing over time, the FE absorbs most of their explanatory power and estimates of these variables become inefficient (Plümper and Troeger, 2007). Since we attach importance to the estimation of time-invariant (e.g. distance) and almost time-invariant variables (e.g. the EMU dummy), we apply two further techniques, the Fixed Effects Vector Decomposition (FEVD) estimator and the Hausman and Taylor (HT) estimator, (reported in columns 3 and 4 of both tables, respectively), which deal exactly with the points of critique just mentioned. To provide comparability to earlier studies, we also report the results of the Pooled Ordinary Least Squares (POLS) regression in column 1 of both tables. We corrected for heteroskedasticity and serial correlation in all regressions. The Dickey-Fuller test rejects the null hypothesis of a unit root in the exchange rate variables.

4.2 The Fixed Effects Vector Decomposition estimator

The FEVD procedure estimates in the first stage a standard FE model by conducting a within-groups transformation,

$$\widetilde{M}_{ijt} \mid \iota \widetilde{X}_{ijt} 2 \widetilde{\kappa}_{ijt} \qquad (4)$$

which removes the bilateral effects σ_{ij} and the time-invariant variables T_{ij}. From this, one obtains the estimated unit effects $\hat{\sigma}_{ij}$, including all time-invariant variables, the overall constant term and the mean effects of the time-varying variables. In the second stage, $\hat{\sigma}_{ij}$ is decomposed into an explained part (by the observed time-invariant and rarely changing variables) and an unexplained part h_{ij},

$$\hat{\sigma}_{ij} \mid \varsigma T_{ij} 2 h_{ij}. \qquad (5)$$

In the last stage, the full model including the residual h_{ij} from stage two, but leaving out σ_{ij} is re-estimated using POLS.[10]

$$M_{ijt} \mid \zeta 2 \iota X_{ijt} 2 \varsigma T_{ij} 2 \Upsilon \hat{h}_{ij} 2 \kappa_{ijt} \qquad (6)$$

Hence, if the orthogonality assumption between the time-invariant variables and the unobserved bilateral effects is correct, the estimator is consistent.

4.3 The Hausman and Taylor estimator

Despite the possibility of estimating time-invariant variables via the FEVD estimator, methods making use of FE bear limitations when it comes to the calculation of out-of-sample trade flow predictions. Much information needed to predict accurately EMU imports from the CEECs is contained in the country pair specific terms. The determination of this term for the countries not included in the sample when fitting the model is arbitrary. This problem can be circumvented applying the HT estimator. By using instrumental variables to address the problem of correlation of the unobservable bilateral effects with some of the explanatory variables (as detected by the Hausman test), the estimator additionally allows controlling for potential endogeneity biases caused by RHS variables. In an RE model of the form

$$M_{ijt} \mid \iota_1 X_{1ijt} 2 \iota_2 X_{2ijt} 2 \varsigma_1 T_{1ij} 2 \varsigma_2 T_{2ij} 2 \sigma_{ij} 2 \kappa_{ijt} \tag{7}$$

X_{1ijt} and T_{1ij} are $1\Delta k_1$ and $1\Delta g_1$ vectors of observations on exogenous variables and X_{2ij} and T_{2ij} are $1\Delta k_2$ and $1\Delta g_2$ vectors of observations on endogenous variables, causing a bias in the standard RE estimation. Hausman and Taylor (1981) therefore propose the use of information already contained in the model to instrument the endogenous variables. In the first step, the consistent ι_1 and ι_2 are used to obtain the within residuals. Regressing these on T_{1ij} and T_{2ij}, using X_{1ijt} and T_{1ij} as instruments, yields intermediate, even though consistent estimates of ς_1 and ς_2. With the two sets of residuals (within and overall) it is possible to estimate the variance components, which are used to perform the General Least Squares (GLS) transform. The model is identified as long as $k_1 \varnothing g_2$. Since the estimator is consistent but not efficient, we correct at this stage the variance-covariance matrix by using standard errors that are robust to arbitrary autocorrelation and heteroskedasticity. The HT estimator is then obtained by

$$\acute{M}_{ijt} \mid \iota_1 \acute{X}_{1ijt} 2 \iota_2 \acute{X}_{2ijt} 2 \varsigma_1 \acute{T}_{1ij} 2 \varsigma_2 \acute{T}_{2ij} 2 \acute{\sigma}_{ij} 2 \acute{\kappa}_{ijt} \tag{8}$$

using $\widetilde{X}_{1ijt}$, $\widetilde{X}_{2ijt}$, $\overline{X}_{1ijt}$, $\overline{X}_{2ijt}$ and T_{1ij} as instruments, where $\overset{*}{\varpi}$ represents the GLS transform of a variable, $\overline{\varpi}$ stands for the within-groups mean and $\widetilde{\varpi}$ for the within transform of a variable ϖ.

The selection of variables included in X_{2ijt} and T_{2ij} is not straightforward. We follow the proposition by Hausman and Taylor (1981) and use economic intuition.[11] First, and in response to the critique by Baldwin (2006), we treat the dummy variables for membership in a preferential arrangement as endogenous. Thinking in terms of the traditional OCA theory, this reasoning may hold for monetary arrangements even more than for trade arrangements. Fearing the loss of the exchange rate and an autonomous monetary policy as tools to respond to external shocks, policy makers might only select into a currency union when the level of integration (here reflected by the level of imports) is already high beforehand. In reference to the possibility of export-led growth, a second source of endogeneity bias may stem from the exporter's GDP variable. Its simultaneous instrumentation with the bilateral exchange rate variable improves the model so much that the over-identification test can no longer reject the null of a non-systematic difference between the FE and the HT estimator ($\theta^2_{(11)} | 1.56$). However, we find that instrumenting the importer's GDP variable improves the model further and fully eliminates the endogeneity bias.[12]

V RESULTS

The outputs from the regressions on the full country sample are displayed in Table 1. The estimates in columns (3) and (4) are consistent and efficient, so we refer to them when interpreting the results. In the FEVD estimation all coefficients except for the bilateral real exchange rate and the multilateral landlocked and border variable, show the expected sign and are highly significant. The HT estimator turns, once the correlation between the regressors and the unobservable country pair effects is properly accommodated, the coefficients of some of the time-invariant variables (specifically, the bilateral border, landlocked, common language, EU and the multilateral common language and EA variable) insignificant.[13] The estimates of the traditional gravity variables GDP and distance lie within the usual range.[14] The multilateral counterparts of the bilateral variables are in the FEVD regression significant at the 1%-level and indicate hence, their relevance for the gravity estimation. Our consistent EMU estimate indicates 7% more imports attributable to the introduction of the euro. The result is very well in line with our preliminary analysis (compare Figure 2) and just amidst the

range of estimates found in other post-Rose studies. We believe our result also to be reliable with an eye on the fact that the inclusion of multilateral variables enables us to remove not only the time-invariant part of the omitted variable bias, but to address additionally the time-varying character of the Anderson and van Wincoop (2003) relative price terms. Interestingly enough, the significantly positive average EMU estimate indicates that the common currency did not divert trade from non-members – on the contrary, outside countries highly profited from trading with the currency bloc. This result does not come unexpectedly. Transitory factors, like the appreciation of the euro since 2002 or the relative strength of the US and some of the Eastern and Asian economies help explaining why imports from outside the euro area have even grown faster than intra-EMU imports over the underlying timeframe.

Table 1 about here

Turning to the regression results with yearly EMU dummies (Table 2), one can readily see the robustness of the coefficient estimates. Both, the FEVD and the HT estimator confirm the presumption of an announcement effect. In 1998, the prospect of a common currency has already boosted intra-EMU-12 imports by 8%. The results further suggest a positive impact of the euro across all years until 2002, with the strongest effect on trade in 2001, when Greece entered the currency union. In contrast to the descriptive statistics graphed in Figure 2, our formal econometric analysis shows that the euro did not stimulate trade significantly further since 2003. On the contrary, the FEVD estimator even yields significant coefficients indicating a negative impact of the euro in last two sample periods. These years correspond to the above mentioned appreciation period of the euro. The observation of no further gains for member countries in 2003 and 2004 therefore supports the result of the multilateral EMU dummy, suggesting that intra-EMU imports have to a certain degree been substituted by imports from the ROW.

Table 2 about here

In order to predict the impact of EMU accession for the CEECs, we construct and investigate two scenarios, both based on a HT regression over the entire timeframe 1991-2004: In the baseline scenario we predict the EMU-12 imports from the CEECs in a world without the euro. In the counterfactual scenario, we base our import predictions on the estimated model controlling for the EMU. For measuring the EMU impact correctly, a few

adjustments have to be made: In the counterfactual scenario, the bilateral and the multilateral EMU variables take the value of 1 and 0, respectively. In addition to this, we adjust the real exchange rate variable, such that from the time of the euro adoption only real changes are allowed whereas the nominal exchange rate is held constant. Under the assumption that the same relation between the explanatory variables and imports will hold also for future EMU members, we take the coefficients from the fitted model and apply these to the CEEC dataset. To be precise, by using the saved parameter estimates from the full country sample (columns one and two in Table 3) and from the country sample excluding the CEECs (columns three and four in Table 3) and combining these with the observations on the CEECs, we obtain the corresponding values for the import variable. Comparing the 2004 forecasts on EMU-12 imports of the baseline (without euro) with the counterfactual scenario (with euro), we obtain a prediction of the extent to which a future EMU accession of the CEECs will further stimulate trade (see Table 3).

Table 3 about here

In fact, the EMU membership will boost EMU-12 imports from five (four in the full sample estimation) CEECs beyond the level attained through their EU accession – Poland, Latvia and Lithuania (and the Slovak Republic) cannot expect further gains when adopting the euro.[15] The out-of-sample predictions of imports (i.e., those based on parameter estimates gained from a country sample which does not include the CEECs) broadly confirm the direction of the effect of the full sample. Given the results for the multilateral EMU dummy variable of Table 1 and 2, the relative low or even negative impact of the euro adoption for some countries does not come surprisingly. Since trade was not diverted from third countries – on the contrary, they benefited even more from the common currency area – the passage to full EMU membership may in this setting have a negative effect on their performance.

Table 3 gives some intuition with respect to the hypothesis that the EMU impact is higher for well-integrated economies. The negative prediction for the less-open Polish, Latvian and Lithuanian economies in both regressions clearly speaks in favor of the classical OCA theory. In contrast, the simulation results for the Czech Republic and Slovakia, the countries with the highest imports over GDP ratios reveal a relatively low EMU impact and strengthen, therefore, the validity of the OCA endogeneity hypothesis (compare Figure 3). We also investigated the issue on a more formal level. For this purpose, we conducted a Spearman rank correlation analysis of the relation between the ranking of the CEECs concerning trade

openness in 2004 and the ranking of these countries with respect to their fictitious gains from adopting the euro in 2004 (Table 4).

Table 4 about here

For both the full country sample and the out-of-sample scenario there is no significant relationship. Only by calculating the rank correlation coefficient over the entire time span (1991-2004), we find a significantly positive relation between the CEECs' openness and their gain in the EMU's import share. Hence, there is some evidence that a high degree of openness beforehand determines a positive trade impact of EMU membership.

VI CONCLUSIONS

This paper's motivation has been twofold: First, we attempted to address all the commonly accepted mistakes in gravity estimation to obtain unbiased currency effects on trade. Using the HT estimator we took into account the possibility of reverse causality between membership in a currency bloc and the import value. By including multilateral time-variant variables we corrected for the omitted variable bias present in earlier studies that only rely on country pair fixed effects. Finally, with the proxies for the Heckman correction term, we addressed the possibility of selection bias. With this specification, we obtain a point estimate for the EMU dummy of 0.07, much lower than Rose's result but well in line with Micco, Stein and Ordoñez (2002) and Flam and Nordstrom (2003). Second, we would like to argue that our procedure allows deriving some policy implications. As the yearly EMU estimates for 2003 and 2004 indicate that the euro did not contribute to any increase in imports in these years, it seems that the EMU-12 has already exhausted its trade-creating potential. On the one hand, this fact may deliver an argument for current members to opt for a quick entry of the CEECs, once they have fulfilled the Maastricht criteria, although their importance for the EMU-12 is by far lower than the other way around. On the other hand, the Spearman rank correlation suggests that gains from EMU membership are larger if the openness towards the euro area has been substantial beforehand. The predictions finally suggest that the Czech Republic, Estonia, Slovenia, Hungary (and Slovakia in the out-of-sample estimation) can expect further gains in the EMU-12 import share once they adopt the euro. Therefore, these countries, too, may put efforts to fulfill the accession criteria in the near future.

One task that we have left open for further investigation is the role of exchange rate volatility in this kind of models. By implementing a variable measuring exchange rate volatility one could control for the exchange rate regimes the CEECs have up to today. We leave this task for future research.

[1] We are only aware of the studies by Maliszewska (2004) and Brouwer, van Dijk and Viaene (2007) dealing with this issue empirically.

[2] In this paper, we conceive the CEECs as the group formed by the Baltic States (Estonia, Latvia and Lithuania), Czech Republic, Hungary, Poland, Slovakia, and Slovenia.

[3] Clearly, the EMU-12 is much more important for the CEECs than the other way around. Due to restrictions concerning the availability of trade data, we are constrained to look at EMU-12 imports from the CEECs.

[4] For a comprehensive discussion, see Gros and Thygesen (1998).

[5] As Brouwer, van Dijk and Viaene (2007), we follow Baldwin's suggestion and include import and GDP data in nominal terms (Baldwin, 2006). The relative price terms pick up idiosyncratic year-specific shocks and are in our case controlled by the multilateral time-varying variables.

[6] A rise in the real exchange rate implies a depreciation of country i's currency against country j's currency.

[7] See Table A.1 for variable definitions and sources.

[8] Since taking the sum of the average exchange rates of both trading partners would have offsetting effects, we consider in this case simply the average exchange rate of country i towards all trading partners except the particular trading partner j.

[9] We additionally control for participation in the EU and in the European Agreements (EAs) and define the multilateral counterparts of these two variables in the same way as the average EMU dummy.

[10] Also, at this third stage, a robust variance-covariance matrix is applied to eliminate panel heteroskedasticity.

[11] The validity of the instruments can be tested. When the null of $p\lim_{n\rightarrow\infty}\frac{1}{n}\sum_{i=1}^{n}\overline{X}_{1ijt},\sigma_{ij}\mid 0$ and

$p\lim_{n\rightarrow\infty}\frac{1}{n}\sum_{i=1}^{n}T_{1ij},\sigma_{ij}\mid 0$ cannot be rejected, $\overline{X}_{1ijt}$ and T_{1ij} are uncorrelated with the random effect σ_{ij} and no further instrumentation is needed.

[12] Since the instrumentation of the trade cost variables could not further improve the model, we treat the time-invariant HC1 variable as endogenous.

[13] Among others, Egger (2002) finds a similar effect when applying the HT estimator.

[14] As stated by Anderson (1979), GDP estimates my slightly differ from the theoretically predicted unitary elasticity due to the existence of non-tradeable goods.

[15] This result is in contrast to a study by Maliszewska (2004), who finds – based on a POLS model – throughout positive impacts of the euro.

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Figures and Tables

Figure 1: EU and euro area imports from the CEECs

Billions US$
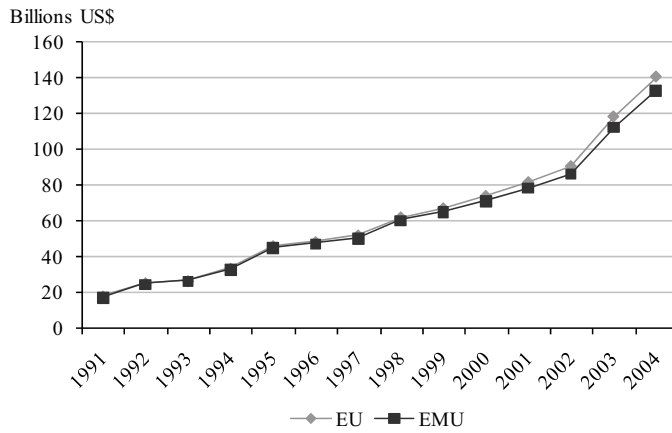
Source: Own calculations, data from OECD.

Figure 2: Increase in intra-EMU imports relative to intra-EU imports

Source: Own calculations, data from OECD.

Figure 3: EMU openness of the CEECs in 2004

Imports/GDP

Source: Own calculations, data from OECD and UN.

Table 1: Estimation results with EMU dummy for the entire period (1998-2004)

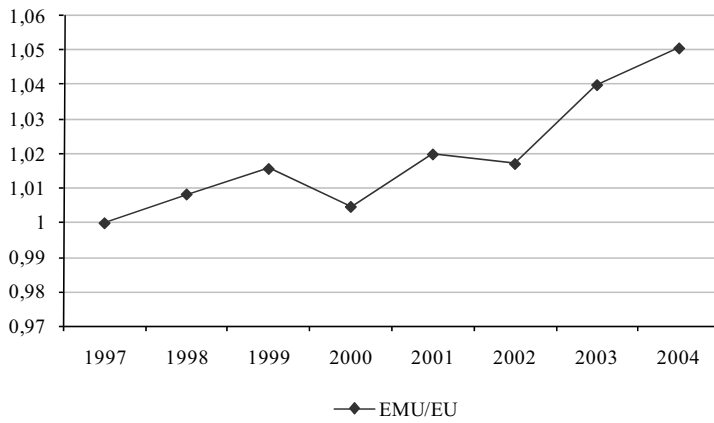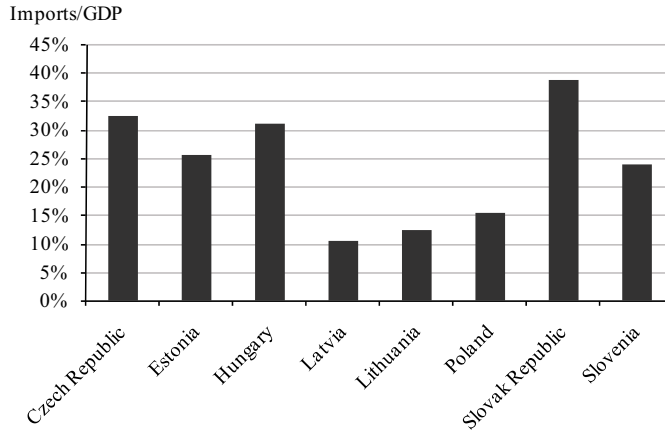|	(1) POLS	(2) FE	(3) FEVD	(4) HT
Lngdpim	0 .88***	0.68***	0.68***	0.68***
	(0.04)	(0.11)	(0.00)	(0.10)
Lngdpex	0.89***	0.71***	0.71***	0.71***
	(0.03)	(0.07)	(0.00)	(0.07)
Lrer	-0.01	0.13**	0.13***	0.13***
	(0.01)	(0.06)	(0.00)	(0.04)
Ldist	-1.27***		-1.41***	-1.75***
	(0.11)		(0.00)	(0.16)
Border	-0.00		0.00***	-0.00
	(0.00)		(0.00)	(0.00)
Ll	-0.16*		-0.23***	-0.15
	(0.10)		(0.00)	(0.13)
Cl	0.23*		0.13***	0.01
	(0.12)		(0.00)	(0.15)
Eu	0.08	0.03	0.03***	0.03
	(0.09)	(0.05)	(0.00)	(0.05)
Ea	0.16*	0.22***	0.22***	0.22***
	(0.10)	(0.06)	(0.00)	(0.05)
Emu	0.13**	0.07**	0.07***	0.07**
	(0.05)	(0.03)	(0.00)	(0.03)
Lavrer	1.22***	0.45**	0.45***	0.45**
	(0.41)	(0.23)	(0.01)	(0.22)
Lavdist	0.55***		0.93***	1.45***
	(0.15)		(0.00)	(0.23)
Avborder	0.00***		0.01***	0.01***
	(0.00)		(0.00)	(0.00)
Avll	-0.10***		-0.14***	-0.18***
	(0.03)		(0.00)	(0.05)
Avcl	-0.02		-0.40***	-0.45
	(0.26)		(0.00)	(0.34)
Aveu	-0.74***	-0.22*	-0.22***	-0.22*

	(1)	(2)	(3)	(4)
	(0.21)	(0.12)	(0.01)	(0.12)
Avea	0.34	-0.07	-0.07***	-0.07
	(0.23)	(0.11)	(0.01)	(0.10)
Avemu	0.22*	0.69***	0.69***	0.69***
	(0.12)	(0.09)	(0.01)	(0.08)
hc1	0.09***		0.10***	0.09*
	(0.03)		(0.00)	(0.05)
hc2	0.00			
	(0.00)			
hc3	-0.18***	-0.03	-0.03***	-0.03
	(0.04)	(0.03)	(0.00)	(0.03)
Observations	5262	5262	5262	5262
R-squared	0.89	0.98	0.98	0.83

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Source: Own calculations.

Table 2: Estimation results with yearly EMU dummies

	(1) POLS	(2) FE	(3) FEVD	(4) HT
Lngdpim	0.88***	0.75***	0.75***	0.75***
	(0.04)	(0.12)	(0.00)	(0.11)
Lngdpex	0.90***	0.75***	0.75***	0.76***
	(0.03)	(0.07)	(0.00)	(0.07)
Lrer	-0.01	0.13**	0.13***	0.12***
	(0.01)	(0.06)	(0.00)	(0.04)
Ldist	-1.27***		-1.38***	-1.68***
	(0.11)		(0.00)	(0.16)
Border	-0.00		0.00***	-0.00
	(0.00)		(0.00)	(0.00)
Ll	-0.16		-0.20***	-0.15
	(0.10)		(0.00)	(0.12)
Cl	0.23*		0.15***	0.05
	(0.12)		(0.00)	(0.15)
Eu	0.06	-0.01	-0.01***	-0.01
	(0.09)	(0.05)	(0.00)	(0.05)
Ea	0.15	0.23***	0.23***	0.23***
	(0.10)	(0.06)	(0.00)	(0.05)
emu1998	0.24***	0.07***	0.07***	0.07***
	(0.05)	(0.02)	(0.00)	(0.02)
emu1999	0.24***	0.05*	0.05***	0.05*
	(0.06)	(0.03)	(0.00)	(0.03)
emu2000	0.33***	0.15***	0.15***	0.15***
	(0.06)	(0.03)	(0.00)	(0.03)
emu2001	0.25***	0.16***	0.16***	0.16***
	(0.06)	(0.03)	(0.00)	(0.03)
emu2002	0.14**	0.07*	0.07***	0.07**
	(0.06)	(0.04)	(0.00)	(0.03)
emu2003	0.01	-0.02	-0.02***	-0.02
	(0.05)	(0.04)	(0.00)	(0.04)
emu2004	-0.06	-0.07	-0.07***	-0.07
	(0.06)	(0.06)	(0.00)	(0.05)
Lavrer	1.14***	0.47**	0.47***	0.48**
	(0.41)	(0.23)	(0.01)	(0.22)
Lavdist	0.54***		0.82***	1.29***
	(0.15)		(0.00)	(0.23)
Avborder	0.00**		0.00***	0.01***

	(0.00)		(0.00)	(0.00)
Avll	-0.10***		-0.13***	-0.17***
	(0.03)		(0.00)	(0.05)
Avcl	-0.01		-0.41***	-0.40
	(0.26)		(0.00)	(0.33)
Avemu	0.24**	0.63***	0.63***	0.63***
	(0.12)	(0.09)	(0.01)	(0.08)
Aveu	-0.75***	-0.28**	-0.28***	-0.27**
	(0.21)	(0.13)	(0.01)	(0.12)
Avea	0.30	-0.04	-0.04***	-0.04
	(0.23)	(0.11)	(0.01)	(0.10)
hc1	0.09***		0.09***	0.08*
	(0.03)		(0.00)	(0.05)
hc2	0.00			
	(0.00)			
hc3	-0.17***	-0.05	-0.05***	-0.05*
	(0.04)	(0.03)	(0.00)	(0.03)
Observations	5262	5262	5262	5262
R-squared	0.89	0.98	0.98	0.85

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Source: Own calculations.

Table 3: Overall EMU impact for the CEECs in 2004[a]

	Estimations based on the full country sample		Estimations based on non CEEC country sample (Out-of-sample)	
	in %	in 1000 US\$[b]	in %	in 1000 US\$[b]
Czech Republic	1,34%	383588	10,91%	1369448
Estonia	18,54%	299772	20,16%	754332
Hungary	17,75%	2140202	40,75%	2046566
Latvia	-21,59%	-600630	-19,93%	-1293611
Lithuania	-15,26%	-567905	-8,78%	-654264
Poland	-34,24%	-13739268	-19,00%	-8129648
Slovak Republic	-4,39%	-309540	11,21%	425655
Slovenia	52,12%	4230501	66,51%	8336747

[a] Table entries display the cumulated imports of the euro area from a specific CEEC.

[b] Differences = counterfactual scenario minus baseline scenario.

Source: Own calculations.

Tabelle 4: Spearman rank correlation between openness and EMU effect

	Full sample	Full sample excl. CEECs (Out-of-sample)
2004	0,45	0,55
1991-2004	0,54***	0,54***

* significant at 10%; ** significant at 5%; *** significant at 1%
Source: Own calculations.

A.1 Variable definitions and sources

Table A.1: List of variables

Variable	Definition	Source
M_{ijt}	Yearly imports of country i from country j (in current US$)	OECD ITCS
$Y_{i(j)t}$	Importer and exporter GDP (in current US$)	UN NAMAD
re_{ijt}	Bilateral real exchange rate	UN NAMAD (nom. exchange rates), IMF IFS (producer price index)
D_{ij}	Great circle distance between the two countries of a trading pair	CIA World Factbook (latitudes and longitudes), own calculations based on the harvesine formula
LL_{ij}	Dummy = 1 for one country and = 2 for both countries of the trading pair being landlocked	CIA World Factbook
B_{ij}	Dummy controlling for the length of a common border	CIA World Factbook
CL_{ij}	Dummy controlling for the number of common official languages	CEPII
EMU_{ijt}, EU_{ijt}, EA_{ijt}	Dummy = 1 for both countries of a trading pair being EMU, EU or EA members	