ARE CENTRAL EUROPEAN COUNTRIES PART OF THE EUROPEAN OPTIMUM CURRENCY AREA?

by

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Costs and benefits of monetary union for a Central European country : the theory

The theory of optimum currency areas (OCA) has analysed the conditions that countries should satisfy if they want to profit from joining a monetary union. The main insights of the theory can be summarised as follows. When countries are different in economic structures, they are likely to face 'asymmetric shocks'. In the absence of the exchange rate instrument, they will need a lot of flexibility in their labour markets (e.g. wage flexibility, labour mobility) so as to adjust to these asymmetric shocks and to prevent these shocks from leading to permanent unemployment. The OCA-theory also stresses that the cost of relinquishing the exchange rate instrument declines with the openness of the country. For very open countries the exchange rate instrument loses much of its effectiveness to affect output and employment, and therefore to correct for asymmetric shocks. Thus, very open (and typically small) countries bear fewer costs by joining a monetary union than large and relatively closed economies. Conversely, the benefits of a single currency increase with the degree of openness of a country, because more contracts involve exchange rate transactions in small open economies than in large and relatively closed one.

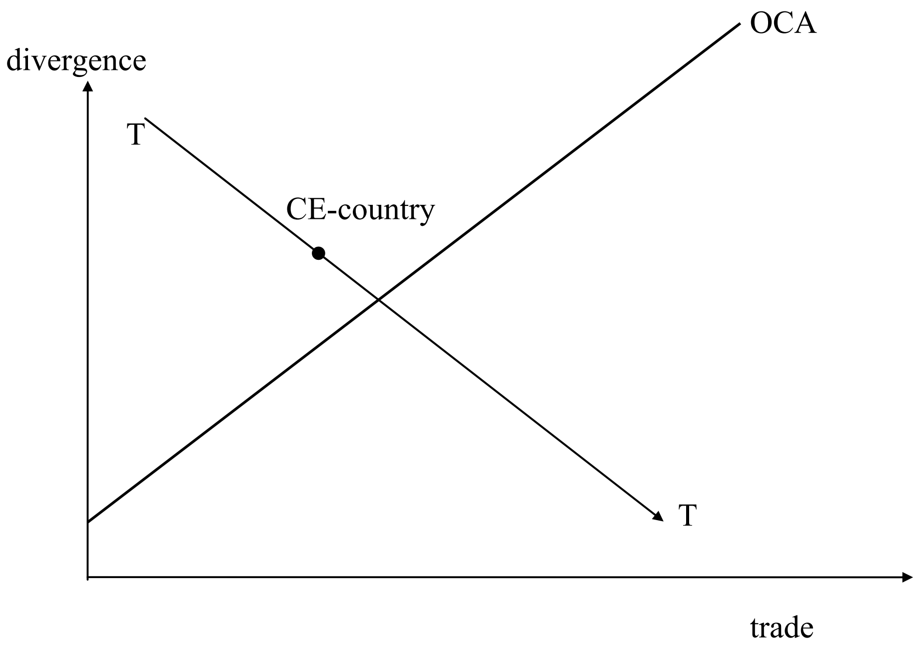
We can represent the main insights of the OCA-theory graphically as follows. On the vertical axis we set out the degree of divergent movements of output and employment between a representative Central European country (CE-country) and the European Union. We call this the degree of economic divergence[1]. On the horizontal axis we set out a measure of the degree of trade integration between these countries. This measure could be the trade of the CE-country with the EU-countries as a share of the CE-country's GDP. The downward sloping line (TT) says that as trade integration between The CE-country and the EU increases the degree of economic divergence between the countries involved declines, i.e. countries become more alike and face less asymmetric shocks. The presumption here is that economic integration between the CE-country and the EU will take the form of intra-industry specialisation. As a result, when a shock occurs in one industry, it will affect all countries in a similar

[1] We could take as measure of divergence one mines the correlation coefficient between the growth rates of output of these countries. Thus when the correlation is one, our measure of

way. (This is only one view, however. There is another view, however, that will be discussed shortly).

The upward sloping line (called OCA) represents the combinations of divergence and trade integration that makes monetary union a break-even operation (costs = benefits). It is derived as follows. The OCA-theory tells us that as trade integration increases the benefits for the CE-country rise and the costs decline. Put differently, the net gains of a monetary union increase with the degree of trade integration. At the same time, when economic divergence increases, the costs of a monetary union increase. The two phenomena together allow us to interpret the upward sloping OCA-schedule as follows: an increase in economic divergence makes a monetary union more costly; this increase in the cost of a monetary union, however, is offset by increasing economic integration. All points on the OCA-line are then combinations of divergence and integration for which the monetary union has a zero net gain. Note that all the points to the right of the OCA-line are points for which the benefits of monetary union exceed the costs. We call it the OCA-zone.

Figure 1: Costs and benefits of monetary integration for the CE-country



divergence is zero. When the correlation is -1 our measure of divergence would be 2, its maximum value.

The effect of changes in labour market flexibility can be presented by shifts in the OCA-line. When labour market flexibility increases, the cost of a monetary union declines. Thus, a country can afford to experience larger asymmetric shocks and still find monetary union gainful. The OCA-line shifts upwards when labour market flexibility increases. This also increases the size of the OCA-zone relative to the non-OCA-zone.

The crucial question now is where we should put the CE-country? In figure 1 we have put the CE-country on the downward sloping TT-line to the left of the OCA-line. That is, we assume that today the CE-country is not yet part of the European optimum currency area, basically because the degree of economic divergence is still to high and/or the degree of trade integration to low. This is however a purely empirical matter. We will return to this issue in section where we analyse some of the important factors to check whether our hypothesis is the right one.

The model of figure 1, allows us to say something about the long-term perspectives of monetary union for the CE-country. As trade integration between the CE-country and the EU proceeds, the CE-country will be moving downwards along the TT-line. This will inevitably bring the country into the OCA-zone. Thus, in this view, monetary unification of the CE-country with the EU will increasingly become more profitable. In this sense monetary union of the CE-country with the EU is inevitable.

The analysis of figure 1 also makes clear that steps towards increasing the degree of labour market flexibility in the CE-country speed up the moment in which a monetary union yields a net gain for the CE-country. Graphically policies introducing more flexibility in the labour market shift the OCA-curve upwards and bring the CE-country closer to the OCA-zone (they could even bring the CE-country immediately into the OCA-zone).

The view presented in figure 1 can be called the conventional view of the dynamics of monetary integration. It has been defended most forcefully by the European Commission in its well-known report 'One Market. One Money'. There is an alternative view, however, that can be derived from Krugman's analysis of the effects of economic integration on the occurrence of asymmetric shocks. This view is based on the idea that by increasing the size of the markets, economic integration leads to a better exploitation of (static and dynamic) economies of scale. As a result, economic integration leads to regional concentration and agglomeration effects. This leads to a more specialised industrial structure of countries, which in turn increases the probability of asymmetric shocks. Thus, in this view economic integration leads to more divergence in the growth rates of output and employment between countries. We represent this alternative view in figure 2. Instead of a downward sloping TT-line we have a positively sloped TT-line. Thus, when economic integration between the CE-country and the EU increases, the CE-country becomes more specialised so that it will be subjected to more rather than less asymmetric shocks[2].

We now have to consider two possibilities for the long-term prospects of monetary union. One is represented by the TT-line, the slope of which is flatter than the slope of the OCA-line. In this case, although today the CE-country may not be an optimum currency area, it will move into the OCA-zone over time. In this case more integration leads to more specialisation and thus more asymmetric shocks. However, the benefits of a monetary union also increase steeply with the degree of integration. As a result, despite the increase in asymmetric shocks, more integration will lead the CE-country into the OCA-zone.

The second case is represented by the steep TT'-line. Here integration brings the CE-country increasingly farther away from the OCA-zone. This is so because the net gains of a monetary union do not increase fast enough with the degree of integration. As a result, the costs of divergence overwhelm all the other benefits a monetary union may have. In the long run the prospects for a monetary union of the CE-country with the EU-15 are poor.

From the discussion of the Krugman model we conclude that even if integration leads to more asymmetric shocks, this may still lead to increasing net gains of a monetary union for the CE-country. We cannot exclude, however, that the process of integration will make monetary union for the CE-country more and more unattractive.

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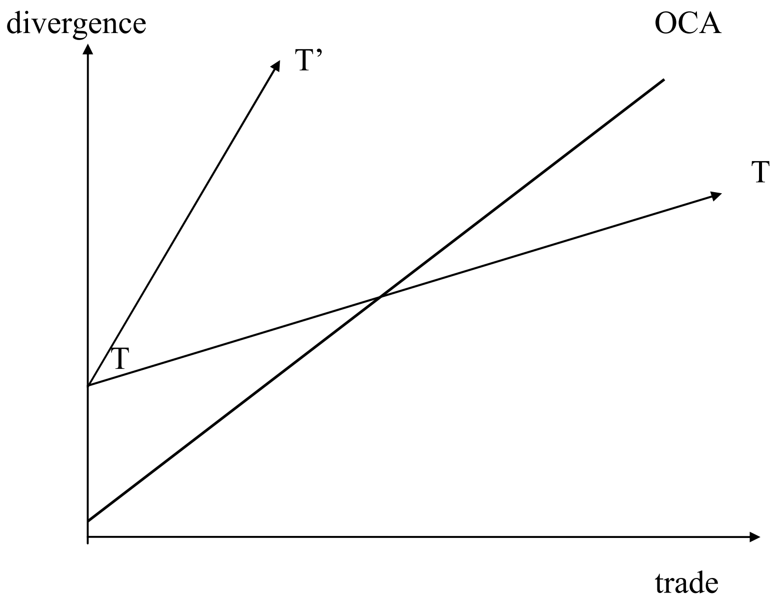
[2] This view could also be associated with Peter Kenen who stressed that countries with a less diversified output structure are subject to more asymmetric shocks making them less suitable to form a monetary union. The presumption is that small countries who are highly integrated with the rest of the world are also highly specialised. This leads to the paradox that small and very open countries should keep their own currencies and not join a monetary union (see Frankel and Rose(1996) on this paradox and how it can be resolved).

Figure 2: The Krugman view of monetary integration



What is the right view of the world? A clear-cut answer will be difficult to formulate. Nevertheless it is reasonable to claim that a presumption exists in favour of the European Commission view. The reason can be formulated as follows. The fact that economic integration can lead to concentration and agglomeration effects cannot be disputed. At the same time, however, it is also true that as market integration between countries proceeds, national borders become less and less important as factors that decide about the location of economic activities. As a result, it becomes more and more likely that concentration and agglomeration effects will be blind for the existence of borders. This creates the possibility that the clusters of economic activity will encompass borders. Put differently, it becomes more and more likely that the relevant regions in which some activity is centralised will transgress one or more borders. For example, it could very well be that the agglomeration effects lead to concentration of industries in Northern Italy and Slovenia. If this is the case, shocks in these industries will affect Italy and Slovenia, so that the lira/tolar rate cannot be used to absorb this shock.

Note that the argument we develop here is not that integration may not lead to concentration effects (it probably will), but rather that national borders will increasingly be less relevant in influencing the shape of these concentration effects. As a result, regions may still be very much affected by asymmetric shocks. The probability that these regions overlap existing borders, however, will increase as integration moves on. We conclude that the economic forces of integration are likely to rob the exchange rates between national currencies of their capacity to deal with these shocks.

From the preceding arguments it should not be concluded that economists know for sure what the relationship is between economic integration and the occurrence of asymmetric shocks. All we can say is that there is a theoretical presumption in favour of the hypothesis that integration will make asymmetric shocks between nations less likely. The issue remains essentially an empirical one. Recently, Frankel and Rose (1996) have undertaken important empirical research relating to this issue. They analysed the degree to which economic activity between pairs of countries is correlated as a function of the intensity of their trade links. Their conclusion was that a closer trade linkage between two countries is strongly and consistently associated with more tightly correlated economic activity between the two countries. In terms of figures 1 and 2 this means that the relationship between divergence and trade integration is negatively sloped.

Similar evidence is presented in Artis and Zhang(1995), who find that as the European countries have become more integrated during the 1980s and 1990s, the business cycles of these countries have become more correlated.

2. Costs and benefits of monetary union for the CE-country : some empirical tests

In this section we develop some empirical tests to find out whether our hypothesis about the location of the CE-country in figure 1 is the correct one. The reader should be warned that these empirical tests are far from definitive. They can only give some approximate idea about the costs and benefits of a monetary union for the CE-country.

The OCA-theory has identified three sets of factors that matter in determining whether the CE-country would benefit from a monetary union. These are :

- The degree of trade integration of the CE-country with the EU and its likely future development.
- The size and the frequency of asymmetric shocks to which the CE-country is likely to be subjected. In this context the different economic and industrial structure of the CE-country versus the other EU-countries matters.
- The degree of flexibility of the labour markets in the CE-country.

In this section we concentrate our attention on the nature of the asymmetric shocks in the CE-country. We use a panel data model that allows us to find out to what extent the growth rates of output and employment in the CE-country have been different from those observed in the European Union. Ideally one should separate the shocks that are induced by different monetary policies (and that will disappear in a future monetary union) from the shocks that are structural (and that will not disappear in a monetary union). A procedure to separate these shocks has been proposed by Blanchard and Quah (1989). This consists in using the neo-classical macroeconomic model to separate demand and supply shocks in the times series of output and employment. It is reasonable to assume that demand shocks are very much conditioned by the nature of the monetary regime, whereas supply shocks are not. Put differently, in a monetary union supply shocks will not disappear. As a result, an analysis of the degree of correlation of these supply shocks across countries can teach us whether these countries are likely to be hit by asymmetric shocks once they form a monetary union. In so doing, we gain insights into an important question, i.e. the size of the asymmetric shocks that potential members of a monetary union will face. (For applications of the Blanchard-Quah procedure see Bayoumi and Eichengreen (1992) and (1996), Elke-Roussel and Mélitz (1995).

Unfortunately, this procedure requires relatively long time series. These are as yet unavailable for central European countries. As a result, we will rely on a procedure which does not attempt to separate demand and supply shocks.

The model used in this paper aims at separating the common (international) and the country (asymmetric) sources of shocks in output and employment.[3] In order to do so, we proceed in two steps. We first specify a static panel data model. In a second step we add some dynamics to the model.

2.1 The static model

The static model is specified as follows:

$$\Delta y_{i.t} = a + \sum_{t}^{T-1} b_t D_t + \sum_{i}^{N-1} c_i D_i + e_{i,t} \quad (1)$$

where $\Delta y_{i.t}$ is the percentage change in the dependent variable (GDP, employment, and industrial production, respectively) in year t and country i; a is the constant term; D_t is a set of time dummies, one for each year; D_i is a set of country dummies, one for each country; and $e_{i,t}$ is the disturbance term to country i at time t and assumed to be an i.i.d. random variable.

In this simple form the model explains yearly changes in, say, GDP of country i by two variables. The first one is the common shock D_t. This variable expresses the influence exerted each year by a component which is common to all countries in the sample. The second variable is the country specific (asymmetric) shock, D_i. The latter measures the extent to which the yearly changes in GDP of country i differ from the changes observed in the other countries in the sample. In both sets of variables we have imposed two necessary normalisations to avoid perfect co-linearity. We will set a benchmark country, here Germany, taking the value zero and a benchmark year, the last year of the sample taking the value of zero. Accordingly the estimated coefficients of the country dummies should be interpreted as differences with respect to Germany and those of the time dummies as differences with respect to the last year in the sample.

We estimated equation (1) using data of the EU-countries and the central European countries during the 1990s. We had to use quarterly data and to restrict the analysis to

[3] The model is described more fully in De Grauwe and Aksoy (1997). In this paper we also discuss the problems of the model.

the 1990s due to the limited availability of the data in central European countries.[4] The results are summarised in the following table. [5]

Table 1. Time vs. Country Effects (Static Analysis)

$$\Delta(y_{i,t}) = \alpha_1 + \Sigma_t^{T-1} \beta_t D_t + \Sigma_i^{N-1} \gamma_i D_i + \varepsilon_{it}$$

	R^2			no. of obs.	F-tests		
	Aggregate Shock (%)	Country Specific Shock (%)	Total (%)		General	Time	Country
Dependent Variables $\Delta(y_{i,t})$							
Czech Republic							
Industrial Production (93.2-95.3)	7	9	17	142	0.98	1.11	0.87
GDP (93.2-95.4)	14	1	15	103	0.78	1.44	0.15
Employment (93.2-95.4)	30	12	43	141	3.61*	5.69*	1.27
Slovak Republic							
Industrial Production (93.2-95.3)	9	7	15	142	0.78	2.30*	0.61
GDP (93.2-95.4)	13	2	15	103	0.76	1.38	0.17
Employment (93.2-95.4)	34	10	43	141	3.71*	6.80*	0.92
Slovenia							
Industrial Production (92.1-95.3)	18	15	33	222	3.23*	3.68*	2.80*
GDP (93.1-95.4)	22	1	23	112	1.34	2.36*	0.08
Employment (92.1-95.4)	38	5	42	215	4.63*	7.89*	0.88
Hungary							
Industrial Production (92.1-95.3)	12	7	19	222	1.50	2.01*	0.98
Employment (92.4-95.4)	40	7	46	170	4.54*	8.72*	0.82
Poland							
Industrial Production (91.2-93.3)	11	11	21	160	1.50	1.95*	1.13
Employment (92.1-95.4)	38	4	42	261	4.72*	8.23*	0.72

The results of table 1 allow us to formulate the following conclusions. First, the R^2's suggest that employment changes are better explained by the model than either changes in industrial production or GDP. Second, the contribution of aggregate shocks to the total variability is generally higher than the contribution of country specific shocks. Put differently, changes in output and employment tend to be dominated by common shocks. This is most pronounced for employment changes, and much less so for industrial production where common and country specific shocks are equally important. Third, there is still a large part of the total variability

[4] Quarterly data are from IFS and OECD, Main Economic Indicators. Time series used in the analysis are represented in table 1.

[5] Since our explicit intention is to elaborate each central European country's impact on the formation of the European OCA separately, we regress our static equation including the EU 15 plus one central European country in the country sample. We repeat the analysis for each central European country. We represent the summary of the estimation results for the static equation. (table 1) On the other hand, we have estimated equation 1 taking into consideration the joint effects accruing from five central European countries on the European OCA. The complete estimation results which evaluate the EU 15 together with five central European countries are presented in table 2 in appendix.

that is not explained by the model. One of the possible reasons is the shortness of the sample period.

Table 1 also shows the F-tests of the joint significance of the coefficients of the CE-countries. They test whether adding observations of these CE-countries to the model lead to structural changes in the model. We generally find that we must reject the hypothesis of no structural changes. This is especially so for the time coefficients that show significant structural changes when the CE-countries are added to the sample. It is much less the case for the coefficients of the country dummies. This suggests that the time pattern of the changes in output and employment differs significantly between the CE-countries and the EU-countries. This is much less the case with the average growth rates of output and employment (as measured by the country dummies). Thus, on average changes in output and employment did not seem to be significantly different in the CE-countries as compared with the EU. The difference may lie in a different time pattern. This conclusion should be handled with care, however, because our sample period is extremely short.

In a next step we test whether the central European countries as a whole pass this test. In order to do so we grouped the central European countries' observations together. We also grouped the other countries, i.e. the core, Scandinavia, Southern Europe, the UK and Ireland.[6] The results are presented in table 3. The benchmark group of countries is the core. As a result, the coefficients of the country dummies have to be interpreted as deviations from the core. A simple t-test then measures whether the changes of employment and output have on average deviated significantly in central European countries from the core. As can be seen, we do not observe significant differences. The same holds for Southern Europe. It does not for the Scandinavian countries which have experienced significantly different employment changes. Thus, surprisingly, if we particularly focus on employment patterns we notice that central European countries come closer to forming part of an optimum currency area with the core countries than the Scandinavian countries.

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[6] Note that the European Regions grouped by Core (Austria, Belgium, France, Germany, Luxembourg and the Netherlands), South (Greece, Italy, Portugal and Spain), Scandinavia (Denmark, Finland and Sweden) and Central Europe (Czech Republic, Hungary, Poland, Slovak Republic and Slovenia). Ireland and the United Kingdom are not specified.

Table 3 : [1]

$\Delta y_{i,t}$	Industrial Production	GDP	Employment
Time Dummies			
α	-0.017	-0.008	-0.011
	(-1.00)	(-0.51)	(-1.78)*
1993:2	0.014	0.035	0.006
	(0.70)	(1.70)*	(0.79)
1993:3	0.022	0.017	0.007
	(1.10)	(0.84)	(1.00)
1993:4	0.03	0.02	-0.009
	(1.57)	(0.98)	(-1.33)
1994:1	0.024	-0.009	-0.0016
	(1.17)	(-0.43)	(-0.23)
1994:2	0.025	0.04	0.015
	(1.26)	(2.15)*	(2.21)*
1994:3	0.03	-0.016	0.022
	(1.52)	(-0.77)	(3.11)*
1994:4	0.016	0.026	-0.005
	(0.76)	(1.29)	(-0.65)
1995:1	0.029	-0.005	-0.002
	(1.33)	(-0.24)	(-0.29)
1995:2	0.02	0.03	0.023
	(1.01)	(1.64)	(3.06)*
1995:3	-	0.015	0.014
		(0.74)	(1.91)*
Country Dummies			
Central Europe	0.015	0.004	0.0003
	(1.32)	(0.38)	(0.01)
Scandinavia	0.017	-0.0013	0.012
	(1.17)	(-0.12)	(2.52)*
Southern Europe	0.001	-0.004	0.004
	(0.10)	(-0.28)	(1.17)
Ireland	0.04	-	0.017
	(1.86)*		(2.72)*
UK	0.004	-0.002	0.006
	(0.21)	(-0.13)	(0.92)
Descriptive Statistics			
R^2 (%)	5.28	22.79	30.83
No of observations	172	125	184

[1]t-values are in parenthesis. An asterix indicates that the coefficient is significant at the 95% interval.

2.2 The dynamic model

The static model only allows for a country specific shock which is assumed to be the same each year. We cannot distinguish constant and non constant country effects over time. In this section we incorporate an interaction term to the model which allows us to detect the non-constant country effects over time. We re-estimate the model by including this interaction term between the time and the country dummies for each country separately and we test whether the coefficients of these interaction terms are jointly significant. If they are, we can conclude that these country effects are not constant over time and that there is a typical output-employment cycle for the country concerned. We repeat the same regression for all the other countries in the sample.[7] The model now can be written as follows

$$\Delta y_{i.t} = a + \sum_{t}^{T-1} b_t D_t + \sum_{i}^{N-1} c_i D_i + \sum_{t}^{T-1} e_t D_t D_k + e_{i,t} \qquad (2)$$

for k = 1,..,N

where $D_t D_k$ is the interaction term.

We present the results concerning the significance of the interaction terms in table 4. (In appendix we show the full results in tables 5 to 9). Table 4 allows us to derive the following conclusions. For industrial production we find significantly different cycles in all CE-countries except for Slovenia. For GDP and employment we do not find any significant time varying effects. Thus, the results are mixed. One variable (industrial production appears to follow a strongly different cycle in most CE-countries, whereas other variables do not exhibit such differences.

Table 4. Joint F (Wald) Test for Time Specific Country Dummies

Joint F-Tests	Industrial Production	GDP	Employment
Czech Republic	18.45*	1.37	1.58
Hungary	23.59*	-	1.44
Poland	4.96*	-	1.16
Slovak Republic	63.31*	1.23	0.48
Slovenia	0.84	0.39	0.76

Returning to the theoretical analysis of section 1 (figure 1) we can conclude that some CE-countries may now be located on the right hand side of the OCA-line. Slovenia,

[7] As in the static model, in the dynamic model we are interested in the central European country's 'individual' effect on the European OCA analysis. Thus we will estimate dynamic equation including the EU 15 and only one central European country.

for example, comes closest to this possibility. This conclusion, however, should be considered as a provisional one. As we have indicated earlier, the data set we have used is rather short so that considerable uncertainty continues to exist about the issue of whether the Central European countries belong to the European OCA.

Appendix:

Table 2: Static Analysis: (Regression analysis for the static equation; time dummy coefficients should be interpreted w. r. t. the last year and country dummies should be interpreted w. r. t. Germany)

$\Delta y_{i,t}$	Industrial Production	GDP	Employment
Time Dummies			
α	-0.019	-0.016	-0.020
	(-0.83)	(-0.67)	(-2.19)*
1993:2	0.015	0.035	0.006
	(0.02)	(1.67)*	(0.80)
1993:3	0.023	0.017	0.007
	(1.08)	(0.82)	(0.98)
1993:4	0.032	0.020	-0.009
	(1.53)	(0.96)	(-1.32)
1994:1	0.024	-0.009	-0.0008
	(1.15)	(-0.41)	(-0.11)
1994:2	0.026	0.045	0.017
	(1.24)	(2.10)*	(2.33)*
1994:3	0.031	0.016	0.023
	(1.49)	(0.76)	(3.22)*
1994:4	0.015	0.027	-0.004
	(0.72)	(1.26)	(-0.54)
1995:1	0.029	-0.006	-0.002
	(1.30)	(-0.25)	(-0.25)
1995:2	0.022	0.034	0.022
	(0.99)	(1.57)	(3.08)*
1995:3	-	0.014	0.014
		(0.69)	(1.94)*
Country Dummies			
Austria	0.007	0.013	0.015
	(0.29)	(0.59)	(1.65)*
Belgium	-0.0002	-	-
	(-0.009)		
Czech Republic	0.004	0.01	-0.004
	(0.13)	(0.43)	(-0.40)
Denmark	0.002	0.016	0.023
	(0.07)	(0.68)	(1.76)*
Finland	0.018	0.014	0.024
	(0.70)	(0.63)	(2.67)*
France	0.004	0.003	0.006
	(0.14)	(0.14)	(0.66)
Greece	0.0024	-	0.015
	(0.09)		(1.68)*
Hungary	0.016		0.005
	(0.64)		(0.53)
Ireland	0.038	-	0.025
	(1.68)*		(2.82)*

Italy	0.006	-	0.009
	(0.22)		(0.98)
Luxembourg	-0.003	-	0.007
	(-0.09)		(0.69)
Netherlands	0.005	0.005	0.006
	(0.21)	(0.22)	(0.66)
Poland	-		0.013
			(1.41)
Portugal	-0.007	-	0.013
	(-0.23)		(1.29)
Slovakia	0.043	0.014	0.017
	(1.69)*	(0.62)	(1.94)*
Slovenia	0.007	0.011	0.01
	(0.26)	(0.51)	(1.13)
Spain	0.012	0.004	0.015
	(0.44)	(0.16)	(1.70)*
Sweden	0.021	-0.002	0.017
	(0.81)	(-0.09)	(1.90)*
UK	0.007	0.006	0.014
	(0.25)	(0.26)	(1.56)
Descriptive Statistics			
R^2 (%)	7.59	14.41	36.91
No of observations	172	125	184

Czech Republic (Dynamic Analysis)

Table 3a. Correlation Coefficients (in %)

Joint F-Tests	Industrial Production	GDP	Employment
Austria	18.02	25.60	44.69
Belgium	18.04	-	-
Czech Republic	67.21	28.54	50.17
Denmark	26.70	24.72	-
Finland	34.28	18.19	64.68
France	17.62	16.70	47.02
Germany	18.23	14.59	43.80
Greece	19.03	-	52.49
Ireland	21.14	-	44.12
Italy	16.47	-	43.45
Luxembourg	24.91	-	43.75
Netherlands	19.31	17.30	49.47
Portugal	14.93	-	43.13
Spain	14.86	17.07	44.03
Sweden	19.34	65.27	44.93
U. K.	17.53	16.78	44.84

Table 3b. Joint F (Wald) Test for Time Dummies

Joint F-Tests	Industrial Production	GDP	Employment
Austria	1.04	0.69	5.03*
Belgium	1.01	-	-
Czech Republic	1.04	1.56	6.50*
Denmark	1.68	1.21	-
Finland	1.25	0.89	5.71*
France	1.00	1.32	6.71*
Germany	1.15	1.36	6.00*
Greece	1.22	-	4.84*
Ireland	1.23	-	5.88*
Italy	1.13	-	5.26*
Luxembourg	0.87	-	6.08*
Netherlands	1.09	1.38	6.62*
Portugal	1.39	-	5.45*
Spain	1.14	1.37	5.84*
Sweden	1.21	2.56*	4.99*
U. K.	1.14	1.34	6.29*

Table 3c. Joint F (Wald) Test for Country Dummies

Joint F-Tests	Industrial Production	GDP	Employment
Austria	0.89	0.16	1.73*
Belgium	0.87	-	-
Czech Republic	2.88*	0.34	1.24
Denmark	0.71	0.37	-
Finland	0.81	0.21	2.18*
France	0.87	0.15	2.03*
Germany	0.81	0.16	1.52
Greece	0.92	-	2.40*
Ireland	0.50	-	1.39
Italy	0.46	-	1.62
Luxembourg	0.64	-	1.71*
Netherlands	0.90	0.15	1.77*
Portugal	0.42	-	1.70*
Spain	0.46	0.15	1.67*
Sweden	0.79	1.97*	1.71*
U. K.	0.84	0.16	1.72*

Table 3d. Joint F (Wald) Test for Time Specific Country Dummies

Joint F-Tests	Industrial Production	GDP	Employment
Austria	0.18	1.07	0.37
Belgium	0.21	-	-
Czech Republic	18.45*	1.37	1.58
Denmark	2.48*	1.05	-
Finland	0.37	0.27	6.58*
France	0.12	0.14	0.96
Germany	0.21	0.14	0.34
Greece	0.33	-	2.43*
Ireland	0.66	-	0.26
Italy	0.41	-	0.13
Luxembourg	1.36	-	0.32
Netherlands	0.33	0.19	1.58
Portugal	0.25	-	0.11
Spain	0.14	0.16	0.24
Sweden	0.38	11.87*	0.42
U. K.	0.11	0.14	0.45

[1] F-statistics with asterisks denote that the coefficients are significantly different at 95th percentile.

Hungary: (Dynamic Analysis)

Table 4a. Correlation Coefficients (in %)

Joint F-Tests	Industrial Production	Employment
Austria	19.86	46.89
Belgium	19.76	-
Denmark	25.62	-
Finland	20.14	65.60
France	19.43	48.84
Germany	19.77	46.36
Greece	22.46	54.58
Hungary	72.26	44.95
Ireland	21.37	46.51
Italy	20.26	47.11
Luxembourg	23.61	46.27
Netherlands	19.86	51.30
Portugal	20.10	45.64
Spain	19.67	40.62
Sweden	20.56	42.42
U. K.	19.49	47.77

Table 4b. Joint F (Wald) Test for Time Dummies

Joint F-Tests	Industrial Production	Employment
Austria	1.82*	7.05*
Belgium	1.80*	-
Denmark	2.27*	-
Finland	1.89*	7.92*
France	1.84*	8.75*
Germany	1.87*	8.09*
Greece	2.08*	6.86*
Hungary	4.49*	8.85*
Ireland	1.85*	7.41*
Italy	1.94*	7.81*
Luxembourg	2.02*	8.12*
Netherlands	1.80*	8.96*
Portugal	1.92*	7.33*
Spain	1.74*	8.21*
Sweden	1.67	7.37*
U. K.	1.99*	8.59*

Table 4c. Joint F (Wald) Test for Country Dummies

Joint F-Tests	Industrial Production	Employment
Austria	1.02	0.97
Belgium	0.94	-
Denmark	1.07	-
Finland	0.86	1.39
France	1.00	1.22
Germany	0.86	0.76
Greece	1.05	1.57
Hungary	3.74*	0.77
Ireland	0.53	0.61
Italy	1.00	0.92
Luxembourg	1.08	0.94
Netherlands	0.99	0.96
Portugal	0.96	0.93
Spain	1.00	0.86
Sweden	0.93	1.02
U. K.	0.97	0.89

Table 4d. Joint F (Wald) Test for Time Specific Country Dummies

Joint F-Tests	Industrial Production	Employment
Austria	0.21	0.33
Belgium	0.21	-
Denmark	1.57	-
Finland	0.26	6.46*
France	0.15	0.84
Germany	0.20	0.35
Greece	0.65	2.46*
Hungary	23.59*	1.44
Ireland	0.46	0.25
Italy	0.36	0.38
Luxembourg	1.21	0.32
Netherlands	0.21	1.48
Portugal	0.36	0.12
Spain	0.23	0.16
Sweden	0.35	0.62
U. K.	0.15	0.58

[1] F-statistics with asterisks denote that the coefficients are significantly different at 95th percentile.

Poland (Dynamic Analysis)

Table 5a. Correlation Coefficients (in %)

Joint F-Tests	Industrial Production	Employment
Austria	22.62	42.75
Belgium	23.71	-
Denmark	34.43	-
Finland	24.46	62.02
France	21.78	43.21
Germany	22.63	41.48
Greece	31.57	49.96
Ireland	22.97	41.33
Italy	22.34	41.84
Luxembourg	29.77	41.65
Netherlands	22.53	45.59
Poland	45.75	45.30
Portugal	24.15	40.24
Spain	22.98	40.60
Sweden	26.98	42.70
U. K.	22.28	42.81

Table 5b. Joint F (Wald) Test for Time Dummies

Joint F-Tests	Industrial Production	Employment
Austria	1.81*	6.53*
Belgium	1.80*	-
Denmark	2.44*	-
Finland	1.61	7.07*
France	1.88*	7.89*
Germany	1.76*	7.33*
Greece	1.79*	6.11*
Ireland	1.95*	7.00*
Italy	1.84*	7.10*
Luxembourg	2.44*	7.46*
Netherlands	1.59	8.02*
Poland	2.31*	8.10*
Portugal	1.68	6.53*
Spain	1.61	6.91*
Sweden	1.66	6.22*
U. K.	2.03*	7.89*

Table 5c. Joint F (Wald) Test for Country Dummies

Joint F-Tests	Industrial Production	Employment
Austria	1.14	0.83
Belgium	1.12	-
Denmark	2.27*	-
Finland	1.15	1.36
France	1.11	1.20
Germany	1.05	0.76
Greece	1.40	1.51
Ireland	0.77	0.52
Italy	1.13	0.85
Luxembourg	1.22	0.89
Netherlands	1.19	0.91
Poland	1.63	0.94
Portugal	1.12	0.84
Spain	1.11	0.85
Sweden	1.21	0.82
U. K.	1.13	0.88

Table 5d. Joint F (Wald) Test for Time Specific Country Dummies

Joint F-Tests	Industrial Production	Employment
Austria	0.29	0.59
Belgium	0.49	-
Denmark	2.86*	-
Finland	0.64	6.80*
France	0.13	0.73
Germany	0.29	0.41
Greece	2.29*	2.49*
Ireland	0.35	0.29
Italy	0.23	0.39
Luxembourg	1.74*	0.46
Netherlands	0.38	1.30
Poland	4.96*	1.16
Portugal	0.57	0.10
Spain	0.35	0.14
Sweden	1.12	0.57
U. K.	0.23	0.64

[1] F-statistics with asterisks denote that the coefficients are significantly different at 95th percentile.

Slovak Republic (Dynamic Analysis)
Table 6a. Correlation Coefficients (in %)

Joint F-Tests	Industrial Production	GDP	Employment
Austria	14.79	25.76	45.52
Belgium	15.66	-	-
Denmark	17.72	25.48	-
Finland	14.58	18.08	65.99
France	14.74	16.31	47.77
Germany	14.03	15.92	44.84
Greece	15.52	-	54.62
Ireland	15.06	-	45.21
Italy	14.61	-	44.66
Luxembourg	17.44	-	44.72
Netherlands	15.77	16.91	50.36
Portugal	13.85	-	43.79
Slovak Republic	86.26	27.09	45.90
Spain	13.96	16.64	44.69
Sweden	14.76	64.62	45.60
U. K.	14.48	16.41	45.70

Table 6b. Joint F (Wald) Test for Time Dummies

Joint F-Tests	Industrial Production	GDP	Employment
Austria	1.03	0.68	5.76*
Belgium	1.16	-	-
Denmark	1.08	1.26	-
Finland	1.01	0.85	6.41*
France	1.04	1.27	7.57*
Germany	0.95	1.31	6.92*
Greece	1.16	-	5.92*
Ireland	0.95	-	6.79*
Italy	1.01	-	6.15*
Luxembourg	1.14	-	6.99*
Netherlands	1.14	1.33	7.49*
Portugal	0.98	-	6.20*
Slovak Republic	1.04	1.57	6.50*
Spain	1.00	1.31	6.61*
Sweden	1.01	2.12*	5.67*
U. K.	1.06	1.28	7.16*

Table 6c. Joint F (Wald) Test for Country Dummies

Joint F-Tests	Industrial Production	GDP	Employment
Austria	0.77	0.19	1.31
Belgium	0.61	-	-
Denmark	0.64	0.44	-
Finland	0.58	0.24	1.65
France	0.60	0.16	1.55
Germany	0.56	0.18	1.04
Greece	0.60	-	2.01*
Ireland	0.48	-	1.06
Italy	0.62	-	1.18
Luxembourg	0.66	-	1.27
Netherlands	0.60	0.17	1.23
Portugal	0.58	-	1.27
Slovak Republic	2.10*	0.32	1.23
Spain	0.61	0.17	1.28
Sweden	0.58	1.87	1.25
U. K.	0.59	0.17	1.30

Table 6d. Joint F (Wald) Test for Time Specific Country Dummies

Joint F-Tests	Industrial Production	GDP	Employment
Austria	0.14	1.21	0.40
Belgium	0.30	-	-
Denmark	0.89	1.18	-
Finland	0.11	0.30	7.02*
France	0.13	0.13	0.98
Germany	0.03	0.17	0.45
Greece	0.25	-	2.92*
Ireland	0.18	-	0.34
Italy	0.18	-	0.23
Luxembourg	0.99	-	0.42
Netherlands	0.28	0.18	1.65
Portugal	0.02	-	0.11
Slovak Republic	63.31*	1.23	0.48
Spain	0.04	0.16	0.24
Sweden	0.14	11.58*	0.42
U. K.	0.10	0.14	0.49

[1] F-statistics with asterisks denote that the coefficients are significantly different at 95th percentile.

Slovenia (Dynamic Analysis)

Table 7a. Correlation Coefficients (in %)

Joint F-Tests	Industrial Production	GDP	Employment
Austria	36	35	44
Belgium	36	-	-
Denmark	48	34	-
Finland	36	26	63
France	34	25	46
Germany	34	24	43
Greece	40	-	53
Ireland	39	-	44
Italy	35	-	44
Luxembourg	44	-	43
Netherlands	37	26	49
Portugal	35	-	42
Slovenia	37	26	45
Spain	35	25	43
Sweden	38	66	45
U. K.	34	26	45

Table 7b. Joint F (Wald) Test for Time Dummies

Joint F-Tests	Industrial Production	GDP	Employment
Austria	3.31*	1.45	6.69*
Belgium	3.32*	-	-
Denmark	4.98*	2.17*	-
Finland	3.42*	1.53	7.10*
France	3.24*	2.30*	8.27*
Germany	3.17*	2.37*	7.62*
Greece	3.85*	-	6.45*
Ireland	3.59*	-	7.27*
Italy	3.34*	-	7.27*
Luxembourg	4.09*	-	7.64*
Netherlands	3.59*	2.40*	8.55*
Portugal	3.39*	-	6.85*
Slovenia	3.46*	2.21*	8.36*
Spain	2.96*	2.38*	7.19*
Sweden	3.18*	3.52*	6.43*
U. K.	3.64*	2.41*	8.26*

Table 7c. Joint F (Wald) Test for Country Dummies

Joint F-Tests	Industrial Production	GDP	Employment
Austria	2.83*	0.14	0.85
Belgium	2.65*	-	-
Denmark	3.40*	0.43	-
Finland	2.40*	0.15	1.23
France	2.72*	0.08	1.19
Germany	2.37*	0.11	0.64
Greece	3.05*	-	1.53
Ireland	1.52	-	0.56
Italy	2.73*	-	0.83
Luxembourg	3.27*	-	0.86
Netherlands	2.83*	0.08	0.89
Portugal	2.65*	-	0.83
Slovenia	2.91*	0.08	0.87
Spain	2.72*	0.08	0.84
Sweden	2.66*	1.60	0.87
U. K.	2.65*	0.07	0.85

Table 7d. Joint F (Wald) Test for Time Specific Country Dummies

Joint F-Tests	Industrial Production	GDP	Employment
Austria	0.53	1.63	0.46
Belgium	0.58	-	-
Denmark	4.77*	1.38	-
Finland	0.57	0.35	6.32*
France	0.26	0.19	0.81
Germany	0.27	0.26	0.35
Greece	1.52	-	2.79*
Ireland	1.35	-	0.32
Italy	0.62	-	0.45
Luxembourg	3.53*	-	0.32
Netherlands	0.79	0.27	1.55
Portugal	0.70	-	0.10
Slovenia	0.84	0.39	0.76
Spain	0.45	0.25	0.16
Sweden	1.06	10.27*	0.56
U. K.	0.27	0.27	0.67

[1] F-statistics with asterisks denote that the coefficients are significantly different at 95th percentile.

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