

**TRADE AS INTERNATIONAL TRANSMISSION MECHANISM: THE  
CASE OF CENTRAL AND EASTERN EUROPEAN “NEW” EU MEMBER  
COUNTRIES**

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**Roberta De Santis**

ISAE - Piazza Indipendenza, No. 4, 00185 Rome (Italy);

e-mail: [r.desantis@isae.it](mailto:r.desantis@isae.it)

## **Abstract**

The object of this study is to assess the role of trade in the transmission of currency shocks across geographically close countries. The analysis will focus on identifying and comparing the degree of vulnerability of new EU member states from the Central and Eastern European countries (CEECs) to currency shocks. We interpret the interactions that a centre-periphery model identifies for periphery countries as a possible description of existing interdependencies among CEECs. According to the centre periphery model discussed by Corsetti et al. (1998b), “if there is no pass-through, then direct bilateral trade links may play a more important role than competition in the third market in determining the transmission of exchange rate shocks in the periphery. If there is full pass-through, a high share of bilateral trade within a region can actually limit the extent of beggar-thy-neighbour effects.” These effects are emphasised by a high degree of export similarity among the countries in the periphery.

As a result of the heterogeneity in pass-through and trade structures, it is very difficult to derive a unitary policy implication on the potential sustainability of the exchange rate mechanism (ERM) II. Yet it is possible to single out the country pairs in which the likelihood of transmitting currency shocks is higher. Preliminary results point out that (other things being equal and given the contained intra-periphery trade) the transmission of currency disturbances is lower if the disturbance originates in countries with low a pass-through rate (the Slovak and Czech Republics, Estonia and Latvia) and higher if it originates in countries with a high pass-through rate (Poland, Hungary and Slovenia).

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## **Introduction**

The object of this study is to assess the role of trade in the transmission of currency shocks across geographically close countries. The analysis will focus on identifying and comparing the degree of vulnerability to currency shocks of Central Eastern European countries (CEECs) EU members.

Recent empirical evidence shows that post-shock transmission mechanisms seem to be a continuation of close linkages existing during stable periods. Studies by Forbes (2001), Kaminsky and Reinhart (2000), Caramazza et al. (1999), Glick and Rose (1998), Eichengreen, Rose and Wyplosz (1996) have provided evidence supporting the hypothesis that currency crises spread from one country to another because of trade linkages. They also show that explanations of the international transmission of currency shocks based on trade links across countries perform empirically better than explanations based on similarities in the macroeconomic characteristics of the economies concerned.

The relevance of trade has been considered mainly in empirical analysis characterised by few linkages with theoretical tools. The most of above-mentioned empirical studies identified and measured trade links by means of total export shares either bilateral or in common markets. Theoretical papers studying competitive devaluation in a Centre Periphery (C-P) framework suggest that further progress in the empirical testing of the relevance of trade as transmission channel can be achieved through deeper analysis of trade structure and firms pricing behaviour.

In the analysis that follows the Periphery consists of the group of eight CEECs (Central Eastern European countries). We intend to interpret the interactions that the C-P model identifies for Periphery countries as a possible description of interdependencies existing among geographically close countries. We will build trade indicators for CEECs and use them to gauge how specific features of their trade structure could affect the vulnerability to exchange rate shocks.

Following accession to EU, CEECs will have to adopt the euro, as no opt-out clause is allowed for new entrants. Official positions of European Commission and the European Central Bank indicate that the CEECs should go through the Exchange Rate Mechanism II before the adoption of the euro. This would imply two years in ERM II system with a review of Maastricht indicators at the end of the first year. With few exceptions the CEECs will have eventually to change their exchange rate regime.

The choice to focus on CEECs is due to three main reasons: (i) they have a high degree of trade integration with EU, intra regional trade occurs and thus they are suitable for representing the periphery of EU-15, (ii) their financial markets are not yet fully developed and integrated, thus providing trade linkages with a major role in transmitting the currency shocks, (iii) they are expected to join the ERM II<sup>1</sup> abandoning the exchange rate as instrument to absorb shocks.

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<sup>1</sup> In June 2004 Lithuania, Estonia and Slovenia joined the ERM II.

The proposed approach attempts to make the following contributions to the existing literature: (i) it bridges the gap between the theory and the empirics of transmission of currency shocks via trade linkages; (ii) it explicitly takes into consideration trade structure and firms' pricing behaviour and their effects on transmission of currency shocks (iii) it focuses on CEECs to derive policy implications on potential sustainability of ERM II.

The paper is organised as follows. Section I.1 surveys the theory and empirics of the transmission of crises via trade links. Section II.1 analyses the relations between trade features and currency shocks transmission. Conclusions are presented in the last paragraph.

## **I.1. Transmission of crises via trade links: Theory and empirics**

### **I.1.1 Main empirical studies**

Studies on the transmission of financial and currency crises via trade have followed various routes on the basis of the methodologies and variables set out in the empirical literature. Moreover, they are not closely linked to the theoretical literature. This literature might be grouped in two broad categories: (i) "Contagion" and trade linkages and (ii) "Contagion" and trade structure.

**(i) "Contagion" and trade linkages.** One of the first analyses in this field was produced by Eichengreen, Rose and Wyplosz (1996), who tested the influence of bilateral trade and competition in the third market on the transmission of currency crises. They defined contagion as "*a systematic effect on the probability of a speculative attack which stems from attacks on other currency*".

To test contagion from country  $j$  to country  $i$ , they regressed a binary variable of currency crisis<sup>2</sup> – the "*crisis dummy*" – in country  $i$  on the same variable for country  $j$  weighted by trade data, and on other macroeconomic variables:

$$\text{Crisis}_{i,t} = \omega W_{ij,t} \text{Crisis}_{j,t} + \lambda I(L)_{i,t} + \varepsilon_{i,t}$$

Where:  $W_{ij}$  for  $j \neq i$  is equal to the weight of country  $j$  in country  $i$ 's IMF real effective exchange rate index. These weights take account of both bilateral trade and competition in third markets.

Their estimate for 20 industrial countries from 1959 to 1993 showed that the occurrence of a currency crisis in one country increased the likelihood of speculative attacks in other countries by about 8%. The coefficient of contagion  $\omega$  was positive and significant when trade weights were used, while macroeconomic weights did not perform as well. The authors concluded that trade links are the main channel through which crisis is transmitted.

Caramazza et al. (1999) have estimated a similar equation using a panel probit regression with 41 emerging market countries and, separately, 20 industrial

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<sup>2</sup> They developed an index of foreign exchange rate pressure as a weighted average of exchange rate changes and short term interest rates relative to Germany. This variable "crisis" took value 1 if the index was above a certain threshold, and 0 otherwise

countries during the Mexican, Asian and Russian crises, excluding for each crisis the first country to experience it.

Their crisis variable is very similar in structure to than of Eichengreen et al. In country  $i$  it is regressed on, among other variables, a set of external variables in the years preceding the crisis<sup>3</sup> plus a proxy for trade effect.

The proxy TC is a weighted average of the price and income effects expected to spread from devaluation in a partner country<sup>4</sup>. Caramazza et al. find that TC is not significant, but that it becomes so when multiplied by previous years' current account balances. This seems to suggest that the trade channel significantly affects country  $i$ 's probability of crisis only when it is already suffering from external imbalances.

Glick and Rose (1998) test trade against other macroeconomic factors in order to check whether contagion is regional. They estimate a cross-country equation with 161 countries in five crisis episodes:

$$\text{Crisis}_i = \phi \text{Trade}_i + \lambda \text{M}_i + \varepsilon_i$$

where: Crisis is a binary variable, M is a set of macroeconomic indicators which includes the annual growth rate of internal credit and real GDP, the current account balance divided by GDP, and the change in the nominal effective exchange rate during the year of crisis compared to the average of the past three years. Trade is an indicator of trade linkages defined as:

$$\text{Trade}_i = \sum_k \left\{ \left[ \frac{(x_{0k} + x_{ik})}{(x_0 + x_i)} \right] * \left[ 1 - \frac{|x_{ik} - x_{0k}|}{(x_{ik} + x_{0k})} \right] \right\}$$

where  $x_{ik}$  are exports from  $i$  to  $k$  ( $k \neq i, 0$ ), and 0 is the first victim country,  $x_0$  are total exports of country 0 and  $x_i$  are total exports of country  $i$ . This indicator is a weighted average of the contribution of third markets for the first victim country 0 and for country  $i$ . The weights, the second term of the index, imply that country  $k$  is more important for countries 0 and  $i$ , the more similar the importance of  $k$  is for each of them.

Glick and Rose find strong evidence to support the hypothesis that currency crises spread from one country to another because of trade linkages. They accordingly conclude that currency crises are fundamentally regional phenomena. A limitation of the trade linkages used in the studies described above is that all of them are calculated on total trade flows, with no analysis of the trade structure in terms of products.

<sup>3</sup>The current account balance/GDP ratio and the change in the real effective exchange rate, in the export/GDP ratio and in the terms of trade.

<sup>4</sup> Caramazza et al. choose a relative weight of one to two on the basis of estimates of historical export elasticities. They identify the price effect with the expected loss of competitiveness in country  $i$  due to a crisis in other countries, proxying this effect with the change in the IMF real effective exchange rate index for country  $i$ . This index weights the devaluation in partner countries both by bilateral trade and by competition in third markets.

**(ii) “Contagion” and trade structure.** Diwan and Hoekman (1999) analyse the effects of trade structure on transmission of shocks in terms of a "competition versus complementarity" account. They argue that countries with very similar export structures will compete mainly in third markets outside the region. In this case, the price effect of devaluations by a trade competitor will be negative and the positive income effect almost absent, with a consequent strong incentive to match the devaluation. On the other hand, if most of the trade in a region concerns goods complementary in production (i.e. intermediate goods), then the price effect of a devaluation by a partner is positive for all countries in the region because it enhances the competitiveness of the "joint" production.

Kaminsky and Reinhart (2000) recognize that most of the empirical studies focus on bilateral trade and that when third party trade is considered little attention is given to the commodity composition of potential competitors.

The authors select groups of countries in terms of either high bilateral trade between them or of competition in a relevant third market, examining a sample of industrial and developing countries for the period 1970-1998, including 80 currency crises. They choose bilateral trade clusters by inspecting the ratios of exports in the region to total exports of each country. For third market competitors they also inspect similarities in the product composition of trade<sup>5</sup>.

Forbes (2000) utilizes firm-level information to measure the importance of trade in the international transmission of crises<sup>6</sup>. Results show that companies which had sales exposure to the crisis country and/or competed in the same industries as crisis-country exports had significantly lower stock returns during these two crises. The paper concludes that direct trade effects (income effects) as well as competition in export industries (product-competitiveness effects) “*were both important transmission mechanisms during the later part of the Asian and the Russian crisis*”.

Forbes (2001) seeks to establish whether trade linkages are important determinants of a country’s vulnerability to crises originating elsewhere in the world. She maintains that trade can transmit crises internationally via three distinct, and possibly counteracting, channels: (i) the competitiveness effect, when changes in relative prices affect a country's ability to compete abroad; (ii) the income effect, when a crisis affects incomes and demand for imports, (iii) the

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<sup>5</sup> For each cluster of countries Kaminsky and Reinhart compare the unconditional probability of a crisis occurring in the next 24 months  $P(C)$  with the probability conditioned on the information that there is a crisis elsewhere  $P(C/CE)$ . They treat the difference between these two probabilities as an indicator of the relevance of the trade channel. They find evidence that belonging to the same region as a crisis country increases the probability for other countries of currency crisis occurrence due to trade linkages.

<sup>6</sup> The paper sample includes information on over 10.000 companies from around the world during the Asian and the Russian crises. It focuses on the variation in different company’s stock market performance, which not only tests which types of companies were most affected by these crises but also how these crises spread internationally

cheap-import effect, when a crisis reduces import prices and acts as a positive supply shock<sup>7</sup>.

### **I.1.2 The theoretical literature**

To explain why crises tend to be regional, some recent theoretical models<sup>8</sup> have revived the Nurske's (1944) model of competitive devaluation. According to the latter, trade being bilateral or/and with a third part, once one country devalues, it makes costly - in term of competitiveness and output- for other countries to maintain their parity. An empirical implication of this type of model is that a high volume of trade among the countries involved in a crisis could be observed.

These models analyse how devaluations by one country spreads to others, adopting a Centre Periphery framework. They enable disentanglement of the income and price effects that a devaluation in a country A in the Periphery exerts on a country B in the same region via direct links between these countries and competition in a third country of the Centre (C).

Price effect is due to the fact that devaluations in A, in the presence of nominal rigidities, improve its competitiveness. This causes both an increase in the demand from Centre to Periphery goods and a diversion in world demand away from B goods towards A goods. Income effect operates through improvement in B's and C's terms of trade and the worsening of those of country A.

These two effects have been modelled by Gerlach and Smets (1995) and, in a fully micro founded general equilibrium model, by Corsetti et al. (1998b)<sup>9</sup>. Both models capture bilateral trade and competition in the third market by describing a three-country world where countries A and B peg their currencies to country C's. In the models a nominal devaluation in A translates into a competitiveness gain at least in the short run due to either sticky wages or price rigidities.

Gerlach and Smets model formally how a devaluation in country A can affect trade flows and thereby cause a crisis in country B. They assume that the economies are structurally identical and that each of them produces only one specific good, but consume all three goods. A devaluation in A gives rise, with sticky wages, to a fall in output, a trade deficit, and a reduction in B's price level due to the fact that the prices of A goods in B's currency fall. The excess demand for money arising in B (assuming non accommodating monetary policy) exerts downward pressures on the nominal interest rate, leading to capital outflows, reserves losses, and it may generate a currency crisis.

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<sup>7</sup> Forbes develops a series of statistics measuring each of these linkages for a sample of 58 countries during 16 crises from 1994 to 1999. Of particular interest is the competitiveness statistic, which uses 4-digit industry information to calculate how each crisis affects exports from other countries. The empirical results of Forbes' study suggest that countries which compete with exports from a crisis country and which export to the crisis country (i.e. competitiveness and income effects) have significantly lower stock market returns.

<sup>8</sup> See Bentivogli and Monti (2001) for a complete survey.

<sup>9</sup> The latter constitutes the theoretical basis for the empirical application that We intend to conduct in this chapter and it will be thoroughly discussed in section I.2.

The model shows that the intensity of the transmission through trade is stronger (i) the higher the substitutability between A and B goods, (ii) the greater the weight of foreign goods in B's consumption basket. This model highlights some important aspects. Nevertheless, belonging to the traditional Mundell-Fleming framework, it lacks a micro foundation, it does not focus on the role played by competition in third markets, and it only touches on the issue of pass-through.

Corsetti et al. (1998b) use micro-foundation to develop a more detailed and rigorous model of how trade can transmit crises internationally. They use a general equilibrium choice-theoretic framework to compute the welfare repercussions of a devaluation of A's currency, finding that the negative effects on a partner country emphasized by traditional theory are not always present. Indeed, if the effects deriving from the change in the terms of trade are taken into account, the results may be rather different.

### **I.1.3 Trade features and vulnerability to currency shocks in a Centre-Periphery framework**

One of the aims of this paper is to use the theoretical results of recent open macroeconomic models to develop "theoretically consistent" empirical analysis of how economic disturbances spread. The purpose is to get indications on how much are CEECs vulnerable to currency shocks given their trade structure and relationships.

Among the theoretical models, the one suited to this purpose seems to be the fully micro founded Centre-Periphery model (C-P) developed by Corsetti et al. (1998b). Under certain hypotheses these authors reject the traditional hypothesis that devaluations have always negative repercussions on partner countries. The impact of devaluations in fact depends on the relative and absolute size of the parameters of the model, the most determinant of which are the following:

(i) **Elasticity of substitution between goods.** The degree of substitutability of internationally traded goods is relevant in evaluating country's impact due to transmission of shocks via trade because it determines the size and the direction of the demand switching effects<sup>10</sup>.

(ii) **Firms pricing behaviour and exchange rate pass-through.** It determines the extent to which, the effects of an exchange rate change are "passed through" to a firm's export price. If the exchange rate is reflected in a one-for-one change in prices abroad, then it is referred to as "full pass-through". If none of the exchange rate change is reflected in prices abroad it is referred to as "no pass through".

With full pass-through, a devaluation of A's currency gives rise to an improvement in B's terms of trade, a reallocation of consumption away from B goods, a decline in the market share of B exports in C, and a depreciation of B's exchange rate vis-à-vis C. If B wants to maintain the peg with C, it must reduce the money supply, which implies greater appreciation vis-à-vis A and a greater

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<sup>10</sup> The authors assume that the elasticity of substitution between Centre and Periphery goods is lower than or equal to that between Periphery goods, i.e.  $\rho \leq \psi$ .

loss of market share in C. If B instead matches the devaluation of A's currency, B's terms of trade and market shares do not change. The model shows that the negative effects arising from devaluation in a partner country are off-set in some cases by an improvement in the terms of trade. In fact, with full pass-through, country B obtains also a welfare gain from devaluation in A because of the strong effect on welfare of its terms of trade improvement (see tables in the Appendix).

In case of no pass through Corsetti et al. show that there are no relative price competitiveness effects and export shares of the devaluating country remain the same. Country A's devaluation is beggar thy-neighbour as it reduces exports, revenues and profits of producers in B. The conclusion are more striking than the ones derived under the assumption of full-pass through: the optimal response for country B is always to devalue.

Therefore, according to the Centre Periphery model *“if there is no pass-through, then direct bilateral trade links may play a more important role than competition in the third market in determining the transmission of exchange rate shocks in the periphery. If there is full pass-through, a high share of bilateral trade within a region can actually limit the extent of beggar-thy neighbour effects”*.

(iii) **Degree of trade integration within the region.** The stronger are the intra regional trade links the more vulnerable are the countries because of the negative demand switching effects of devaluations by competitors. However it has to be emphasized that under the assumption of full pass-through there are also positive effects of the improvement in terms of trade of the devaluing country partner.

## **II.1. Indicators of vulnerability linked to trade structure**

### **II.1.1 Why analyse the CEECs case?**

The CEECs are a group of geographically close countries in the “periphery” of the EU. All the eight CEE countries that joined the EU on May 2004 have declared their intention to adopt the euro as early as possible<sup>11</sup>. In terms of the announced monetary strategies of the countries it can be seen that for some of them the decision of join the ERM II soon, from today's perspective, may not suffer from substantial objections.

In the case of Czech Republic, Hungary, Poland and Slovak Republic -the four larger central European economies - the announced strategies suggest a careful examination.

The open question is whether these countries would be able to cope with structural trends towards higher and more volatile output growth, increasing relative price levels and structural fiscal deficits without an independent monetary

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<sup>11</sup> Following the procedures laid down in the Treaty of the Union, their aim is to introduce the euro at the beginning of 2007, subsequent to a two year mandatory period within ERM II starting around mid 2004 and a positive convergence assessment made around mid-2006. ECB, (2003), *An analytical review of the acceding countries strategies towards the adoption of the euro and the ERM II*, Internal Staff paper, March.

policy. Also the four economies are the ones which would need the most aggressive fiscal tightening to meet Maastricht criteria in time for an early adoption of the euro, which may significantly aggravate the economic costs of joining ERM II.

The eight countries, with the relative exception of Poland, are small and highly open economies and they have tight trade relations with EU. The degree of financial integration between CEECs-8 countries and the euro area appears to be still not high and considerable differences exist across indicators and countries. All countries have experienced large and increasing capital inflows in recent years. By far the largest component of these flows is foreign direct investment which is the component of capital flows less vulnerable to financial and currency disturbances.

Although total assets of banking systems as a ratio to GDP have risen in most acceding countries in recent years, the level of financial intermediation is low. This is due to the moderate GDP per capita levels, the relatively short history of banking sectors and the transition process that included bank consolidation and a strong presence of foreign-owned companies.

Monetary transmission through interest and credit channels has become more effective in most acceding countries due to improved banking sector soundness but it is still constrained as consequence of the low depth of financial intermediation.

According to this research, the CEECs case is of great interest to study the transmission of currency shocks via trade, for three main reasons:

(i) The CEECs are going to join (joined in the case of Estonia, Lithuania and Slovenia) the ERM II (see tab A1 in the appendix) and eventually the EMU, abandoning flexible exchange rate as effective instrument for absorbing shocks.

(ii) The CEECs are a group of geographically close countries very suitable for representing the Periphery of EU. They have a high degree of trade integration with European Union and some intra periphery trade occurs. It is possible to interpret the interdependences existing among them bilaterally and in the centre as the interaction that the C-P model identifies for periphery countries.

(iii) The CEECs' financial markets are not yet fully developed and integrated. They seem to have a minor role in transmitting currency shocks. Thus trade linkages seem to be the main channel of transmission of disturbances.

This chapter tries to answer to two main issues: (i) have trade and firms pricing behaviour of CEECs any role in determining the vulnerability to currency shocks? (ii) What are the implication for the ERM II sustainability? If after/due to the joining of ERM II a currency shock occurs in one of CEECs which is the probability of a contagious devaluation in the other countries in the group?

### II.1.2 Trade integration with EU and intra regional trade.

The evolution of trade in acceding countries has been remarkable in the 90s. The degree of openness increased dramatically. The integration with the EU market led to an increase of their market shares in EU trade<sup>12</sup>.

The degree of openness is on average 92 % of GDP (56.7% when taking into account only trade with EU). The most open countries are Estonia, Slovak Republic and Slovenia. The eight CEECs entertain close trade relations with the EU, accounting on average for about 63.7% of total export and about 60.5% of total import (tab1). This compares well with the level of trade integration among the current EU members, whose exports and imports within the EU are on average around 60% of total trade.

**Tab.1 Degree of openness and trade integration CEEC-8 (2002)**

	Degree of openness (Exp+imp)/GDP, (%)		(ExpEu+ImpEu) /(ExpWorld+Imp World)	Trade integration with EU (EU export and import in % of total export and import)	
	To World	To EU		Export	Import
<b>Czech Rep.</b>	94.9	60.8	0.64	68.3	60.1
<b>Estonia</b>	<b>133.3</b>	<b>82.8</b>	<b>0.62</b>	68.0	57.9
<b>Hungary</b>	91.1	59.4	0.65	75.1	56.3
<b>Latvia</b>	75.7	57.2	0.76	60.4	84.1
<b>Lithuania</b>	92.1	43.3	0.47	49.6	45.2
<b>Poland</b>	42.3	27.4	0.65	68.7	61.7
<b>Slovak Rep.</b>	<b>109.4</b>	<b>60.2</b>	<b>0.55</b>	60.5	50.3
<b>Slovenia</b>	<b>97.3</b>	<b>62.1</b>	<b>0.64</b>	59.4	68.0
<b>Average</b>	<b>92%</b>	<b>56.7%</b>	<b>0.62</b>	<b>63.7%</b>	<b>60.5%</b>

Source: WEO IMF, Eurostat New Cronos, Bilateral Trade Database (BTD) and International Trade by Commodity Statistics (ITCS), 2003.

It is worth to notice that, in the group, the countries that are relatively more highly integrated with the EU (Hungary, Latvia and Poland) are those with the lowest degree of openness. The most open economies, such as Estonia, Slovenia, Czech and Slovak Republic, are relatively less integrated with the EU. The lower trade integration with the EU might suggest that these countries, which significantly trade also with non EU countries, could be somewhat more exposed to external demand shocks originating from third countries than EU area.

The analysis of the bilateral export shares by destination of CEE countries confirms that the EU is the main market of destinations, USA and Japan having a minor role as export markets. Among the eight countries (tab.2) trade shares with the other CEE countries are heterogeneous with the lowest shares for Slovenia and the highest for Latvia.

Two sub-groups emerge in which trade is more intensive. The first one is composed by the four largest countries OECD members (Czech Republic,

<sup>12</sup> Zaghini (2003)

Hungary, Poland and Slovak Republic), while the second includes the Baltics (Estonia Latvia and Lithuania) plus Slovenia. There is evidence of intra groups trade in the region, though it seems to play a minor role.

**Tab. 2 Bilateral export shares by destination**

(Total exports %, 2002)

<b>Report Partner</b>	<b>CZ.R.</b>	<b>H</b>	<b>P</b>	<b>SK. R.</b>	<b>E</b>	<b>LV</b>	<b>L</b>	<b>S.</b>
<b>Czech Rep.</b>		2.4	4.7	7.7	0.3	1	0.8	0.1
<b>Hungary</b>	1.9		2.1	1.4	0.6	0.2	1.6	0.4
<b>Poland</b>	4	2.3		1.4	0.5	0.3	6.3	0.1
<b>Slov.Rep.</b>	15.2	5.4	5.3		1.8	1.8	2.8	0.1
<b>Estonia</b>						6	3.2	0.1
<b>Latvia</b>					7.7		12.6	12.6
<b>Lith*</b>					4.1	8.35		0.3
<b>Slovenia</b>					0.02	0.1	0.0	
<b>EU</b>	68.3	75.1	68.7	60.5	60	67.3	63.1	66.2
<b>USA</b>	2.9	3.5	2.7	1.4	2.2	4.3	3.8	2.8
<b>Japan</b>	0.4	0.6	0.2	1	0.6	0.8	0.4	0.2
<b>World</b>	100	100	100	100	100	100	100	100

Source: OECD, Bilateral Trade Database (BTD) and International Trade by Commodity Statistics (ITCS), 2003 and our calculation on United Nations, Comtrade 2003

\*2001

According to classification SITC Rev 3 by each of the eight countries manufactured goods account on average for about 77.4% of export towards EU in CEE countries. The national export shares of each product proxy the importance for any given country of demand switching effects that could arise from a devaluation by a competitor in that specific market. Interestingly, all the eight countries have a very similar export product composition with machinery and transport equipment ranking in the first position. Manufactured goods, miscellaneous manufactured articles and Chemicals and related products have also a major role in export structure of the most of CEECs.

A large part of CEECs trade with the EU is intra industrial, most of which is classified as vertical intra-industrial trade. This may suggest that countries with a high degree of intra-industrial trade will be subject to similar shocks and pattern of industrial activity.

Table 3 shows the Glick and Rose (1998) Trade share and Direct trade indexes measuring respectively competition in third market (EU) and direct trade linkages of CEECs.

The indexes prove a high competition for country pairs in EU market and extremely high bilateral trade links. It is worth to notice that, even given the very high manufactures content of CEECs trade, the indexes computed for total trade and trade in manufactures only, are not very similar. According to the Glick and

Rose Trade share indexes, all countries, with no exception, seem to compete more heavily each other in the manufacture sector, having EU as destination market.

**Tab.3 Glick and Rose trade linkages\* (2002)**

Countries pairs	Competition in third markets (EU) (TradeShare <sup>13</sup> SITC Rev.3)		Direct linkages (Direct trade <sup>14</sup> , SITC Rev.3)	
	Total	Manufactures	Total	Manufactures
<b>ee-lv</b>	0.59	0.69	0.58	0.59
<b>ee-sk</b>	0.62	0.72	0.85	0.53
<b>ee-sl</b>	0.62	0.70	0.32	0.27
<b>ee-hu</b>	0.68	0.78	0.74	0.48
<b>ee-pol</b>	0.66	0.76	0.51	0.55
<b>ee-cz</b>	0.65	0.74	0.52	0.41
<b>cz-lv</b>	0.67	0.81	0.36	0.31
<b>cz-sk</b>	0.65	0.81	0.85	0.80
<b>cz-sl</b>	0.65	0.83	0.87	0.93
<b>cz-hu</b>	0.71	0.79	0.83	0.81
<b>cz-pol</b>	0.68	0.79	0.94	0.86
<b>hu-lv</b>	0.73	0.99	0.22	0.27
<b>hu-sk</b>	0.70	0.96	0.78	0.83
<b>hu-sl</b>	0.70	0.98	0.76	0.90
<b>hu-pol</b>	0.72	0.92	0.89	0.86
<b>sl-sk</b>	0.58	0.69	0.92	0.97
<b>sl-pol</b>	0.66	0.73	0.62	0.56
<b>sl-lv</b>	0.57	0.66	0.27	0.26
<b>pol-sk</b>	0.66	0.88	0.83	0.79
<b>pol-lv</b>	0.68	0.89	0.24	0.24
<b>sk-lv</b>	0.59	0.72	0.51	0.43

\*2002 data for Lithuania are not available

Source: our calculation on COMTRADE UN

The same result does not hold for intra-regional trade. In fact, the Direct trade indexes show that all the CEECs compete against each others with few exceptions (Estonia-Slovenia, Hungary-Latvia, Slovenia-Latvia and Poland-Latvia). However the degree of competition, if only trade in manufacture is considered decreases in more than half of country pairs.

### II.I.3 Elasticity of substitution and trade structure

The degree of substitutability of the different internationally traded goods is relevant in assessing a country's vulnerability to transmission of currency shocks. Other things being equal, it determines the size and the direction of the demand

13 Trade Share<sub>ik</sub> =  $\frac{x_{0k} + x_{ik}}{x_0 + x_i} [1 - \frac{x_{0k}}{x_0} - \frac{x_{ik}}{x_i}] / (\frac{x_{0k}}{x_0} + \frac{x_{ik}}{x_i})$  •where:  $x_{ik}$  = export from i to k ( $k \neq i, 0$ ),  $x_0$  first victim country,  $x_0$  total export of 0,  $x_i$  total export of i. This is a measure of trade linkages and competition in third markets which uses trade share so as to adjust for the varying size of countries.

14 DirectTrade<sub>ik</sub> =  $1 - (|x_{i0} - x_{0i}| / (x_{i0} + x_{0i}))$ . This index is higher the more equal are bilateral export between countries 0 and i.

switching effects. Indeed, the probability of a devaluation is higher in countries producing exports similar to those of the “first victims” country than in the others.

**Tab.4 Indexes of export similarity: the Finger and Kreinin index<sup>15</sup>**  
(On manufactures in % of manufactures export, 2002, export market EU, SITC)

	<b>Estonia</b>	<b>Hungary</b>	<b>Latvia</b>	<b>Lithuania</b>	<b>Poland</b>	<b>S Rep</b>	<b>Slovenia</b>
C. Rep.	80.7	85.3	47.7	61.1	87.4	94.7	88.4
Estonia		70.4	66.6	75.4	91.2	85.2	88.4
Hungary			71.2	53.6	76.7	80.4	74.5
Latvia				59.1	60.2	51.9	57.7
Lithuania					68.8	65.4	68.6
Poland						92.2	95.3
S.Rep.							93.4

Source: our calculation on Eurostat New Cronos.

One simple measure of the substitutability of each country’s exports is the Finger and Kreinin index<sup>16</sup>.

Table 4 shows the indexes values for manufactures products in percentage of total manufactures exports for 2002. They are computed for country pairs with SITC data. The common export market for country pairs is EU-15.

The indexes show a high degree of similarity among the CEECs, with the exception of the country pair Czech Republic-Latvia, whereby the index is relatively smaller. According to these results, trade channels seem to have a powerful role in transmitting currency shocks.

Moreover, the evidence that countries of the same group produce goods that are very similar/substitute in consumption, suggests that changes in their bilateral exchange rates may reduce, even significantly, the welfare of its regional trading partners, through the reduction in the demand for their exports.

#### **II.I.4 Firms pricing policy in response to exchange rate movements**

The exchange rate pass-through determines the extent to which, the effects of an exchange rate change are “passed through” to a firm’s export price. If the exchange rate is reflected in a one-for-one change in prices abroad, then it is referred to as “full pass-through”<sup>17</sup>.

15  $\bullet ES_{ij} = \sum a [\min (x_{ai}, x_{aj})]^* 100$ ,  $x_{ai}$  and  $x_{aj}$  are export shares of country  $i$ ’s and country  $j$ ’s manufactures exports in industry  $a$ .  $\bullet ES = 0 =$  complete dissimilarity,  $ES = 100 =$  identical export composition

16 Finger and Kreinin (1979). It is worth to be underlined that the use of aggregate data for manufacture sector, due to the lack of more disentagled data could produce an overestimation of the indexes.

17 Let  $e$  be the nominal exchange rate,  $PF$  the foreign firm’s price level expressed in domestic currency terms, with the foreign currency price being  $PF/ e$ , the phenomenon of pass through can be, therefore, expressed by  $dPF/ de$ . Alternatively, a more convenient way of expressing the pass through is by computing the price elasticity in the form  $(dPF/ de) (e / PF)$ . In case the latter elasticity equals 1, the full pass through condition holds, while no pass through arises in case of  $(dPF/ de) (e / PF) = 0$ .

If none of the exchange rate changes is reflected in prices abroad, it is referred to as “no pass through”. Theoretical analyses list a number of factors underlying the pricing decisions taken by export firms following an appreciation (depreciation) of their currency.

**Tab.5 Correlation between the export price index and the exchange rate against the euro**

(quarterly data, Q1-1999-Q4-2002)

	<b>Czech Rep.</b>	<b>Hungary</b>	<b>Poland</b>	<b>Slovak Rep.</b>
<b>Correlation coef</b>	0.2	0.9	0.8	-0.1
<b>Average elasticity</b>	0.3	1	0.9	0.1

(quarterly data, Q2-1999-Q4-2002)

	<b>Estonia</b>	<b>Latvia</b>	<b>Lithuania</b>	<b>Slovenia</b>
<b>Correlation coef</b>	0.0	-0.0	0.5	Hps *Coricelli, Zsolt PT=1
<b>Average elasticity</b>	0.0	-0.2	0.4	

Quarterly export price index data for Slovenia are not available, therefore we introduce assumption that the pass-through is = 1 derived by Coricelli et al. (2003) and Zsolt (2001)  
Source: Datastream

The phenomenon of pass-through is the result of a combination of multiple factors, such as the degree of competitiveness of the market, the degree of substitutability among products, the possibility of achieving economies of scale relative to foreign competitors and how permanent the exchange rate devaluation is perceived to be. Therefore, it is difficult to make empirical generalization or make inference about firms pricing behaviour merely based on the extent of the observed pass-through.

In line with the scope of our work, we use a simple measure of exchange rate pass-through on export price based on correlation coefficients and average price elasticity to exchange rate (Table 5).

According to both correlation coefficients and average elasticities, the firms pricing behaviour in Hungary, Poland and Slovenia in the period 1999-2002 has been that of maintaining export prices in terms of their currency close to the pre-appreciation (depreciation) levels. Lithuania is in a middle case with an average correlation between the export price index and the exchange rate against the euro of around 0.5. Czech and Slovak Republic, Estonia and Latvia firm’s export pricing policy, in the same period, appears not to have followed exchange rate movements<sup>18</sup>.

As mentioned before, a devaluation in a country in which there is pass-through and intra periphery trade lead on one side at the worsening of price competitiveness of main trade partners, on the other side at the improvement of their terms of trade. Therefore, under certain conditions, if one of these countries devaluates the others have no incentive in matching the devaluation.

<sup>18</sup> These results are in line with the studies of Coricelli, Jazbec and Masten (2003) and Zsolt (2001), according to which the point estimates of pass-through are higher in Slovenia and Hungary than in Poland, while the pass-through is low in the Czech Republic.

In the case of Estonia, Latvia and Slovak Republic, that seem to have a low pass-through, if a devaluation arises, the intra periphery effect of beggar-thy-neighbour, due to competition in EU, disappears. However there could be an other source of beggar-thy-neighbour, due to the decrease of export shares towards the devaluing country. This effect could worsen the economic conditions of trading partners in the periphery giving to them an incentive to match the devaluation.

### **Concluding remarks**

In table 6 the values of similarity index and of pass-through are presented for each country pairs. The joint analysis of these indicators provides us with some indications concerning currency shocks transmission for each country pairs under exam.

In the North West quadrant of the table- with a lower threshold, arbitrarily chosen, of the similarity index (70) and low degree of pass-through (between 0 and 0.2)- there are Slovak Republic, Latvia, Estonia and Czech Republic. These countries if a devaluation arises and there is intra periphery trade, should transmit with higher probability the currency disturbance to trading partners with similar trade structure.

For example, if Slovak Republic devalues a devaluation could arise in Czech Republic. This probability is enhanced by the following factors: i) a relatively high degree of bilateral trade between the two countries (15.2%), ii) an high index of export similarity (94.7) and iii) of bilateral competition (0.8).

Given that Slovak Republic has a *pass through* equal to 0, the beggar thy neighbour effect that incentives the transmission of currency shock is not due to a price competitive effect. The transmission mechanism occurs mainly through the bilateral trade links: Slovak Republic once devalued could reduce import demand from Czech Republic becoming Czech Republic goods more expensive in its currency. The impact of import demand switch off is the higher, the greater is the bilateral trade between the two countries and the higher is the similarity index between them.

Interestingly, a feed back effect could arise between the two countries (see table 6). Also the Czech Republic has a low degree of pass-through, in fact it is in the same quadrant of the table. Thus implications similar to those for Slovak Republic hold if a devaluation originates in Czech Republic.

In the North East quadrant of the table there are Poland, Hungary and Slovenia. If a devaluation arises They should transmit the shock through the channel of competition in the EU-15 market. A devaluation in Slovenia, which has a pass through of 1, could incentive a devaluation in Poland. The latter has a very high similarity index with respect to Slovenia indeed.

On the one side, Slovenia after devaluation will gain competitiveness causing loss of export shares for Poland in EU-15 market. On the other side, Poland would

gain a positive terms of trade effect. The transmission of shocks is positively correlated to the degree of competition of country pairs in EU 15 and to the degree of similarity of export structures. On the contrary, bilateral trade between Slovenia and Poland would contain the contagion due to the terms of trade effect.

**Tab.6 CEECs currency shocks vulnerability (2002)**

PT F.K	0				0.2	0.5	0.8	0.9	1
	Sk	Lv	Ee	Cz	Lt	Pl	Hu	Sl	
95.3						Pl-Sl		Sl-Pl	
94.7	Sk-Cz			Cz-Sk					
93.4	Sk-Sl							Sl-Sk	
92.2	Sk-Pl					Pl-Sk			
91.2			Ee-Pl			Pl-Ee			
88.4			Ee-Sl	Cz-Sl				Sl-Cz, Sl-Ee	
87.4				Cz-Pl		Pl-Cz			
85.3				Cz-Hu			Hu-Cz		
85.2	Sk-Ee		Ee-Sk						
80.7			Ee-Cz	Cz-Ee					
80.4	Sk-Hu						Hu-Sk		
76.7						Pl-Hu	Hu-Pl		
75.4			Ee-Lt		Lt-Ee				
74.5							Hu-Sl	Sl-Hu	
71.2		Lv-Hu					Hu-Lv		
70.4			Ee-Hu				Hu-Ee		
68.8					Lt-Pl	Pl-Lt			
68.6								Sl-Lt	
65.4	Sk-Lt				Lt-Sk				
66.6		Lv-Ee	Ee-Lv						
61.1				Cz-Lt	Lt-Cz				
60.2		Lv-Pl				Pl-Lv			
59.1		Lv-Lt			Lt-Lv				
57.7		Lv-Sl						Sl-Lv	
53.6					Lt-Hu		Hu-Lt		
51.9	Sk-Lv	Lv-Sk							
47.7		Lv-Cz		Cz-Lv					

PT= Pass-through; FK= Finger and Krenin Index.

It has to be noted that the bilateral trade between Poland and Slovenia is indeed very low (0.1%) This suggests that in this case the price competitiveness effect could exceed the terms of trade effect, enhancing the possibility of currency disturbances transmission. According to the findings of previous paragraph (low intra periphery trade) this effect is likely for all country pairs in this quadrant.

The remaining quadrants of the table represent intermediate situations and ambiguous results could be derived. Nevertheless the logic underlying in all quadrants the analysis is the same as in the North - East, North –West quadrants.

To conclude, in this paragraph it is shown a general theoretically backed framework to interpret the role of trade variables in currency disturbances transmission mechanisms. Due to pass-through and trade structures heterogeneity, it is very difficult to derive a unitary policy implication on ERM II potential sustainability. However it is possible to single out for which country pairs the incentive to transmit currency shocks is higher.

Our results point out that (other things being equal and given the contained intra periphery trade) the transmission of currency disturbances is lower if the disturbance origins in countries with low pass-through (Slovak and Czech Republic, Estonia and Latvia), and higher if origins in countries with high pass-through (Poland, Hungary and Slovenia).

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## Appendix

**Tab A1 Vulnerability to currency shocks**

Corsetti et al. show that in the case of devaluations:

- If: (i)  $\rho > 1^*$  and  $\psi > \rho$ ,  
 (ii) Intra- Periphery trade = 0

then:

	$\psi > 1$	$\psi \leq 1$
Full pass-through (sellers currency)	Beggar-thy-neighbour	Ambiguous (Price effect and terms of trade effect)
No pass-through (buyers currency)	Low vulnerability to currency crisis	Low vulnerability to currency crisis

- If: (i)  $\rho > 1^*$  and  $\psi > \rho$ ,  
 (ii) Intra- Periphery trade  $> 0$

then:

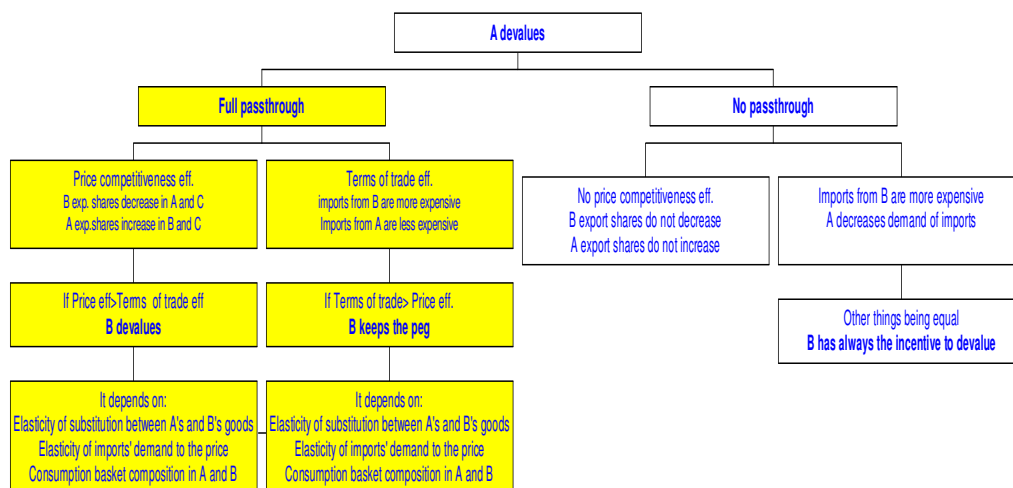
	$\psi > 1$	$\psi \leq 1$
Full pass-through (sellers currency)	Ambiguous (Price effect and terms of trade effect)	Ambiguous (Price effect and terms of trade effect)
No pass-through (buyers currency)	Beggar-thy-neighbour	Beggar-thy-neighbour

\*The periphery as a whole runs a current account surplus vis-à-vis the Centre when country A devalues

$\psi$  elasticity of substitution between Periphery goods,

$\rho$  elasticity of substitution between Centre and Periphery goods.

**Table A2 Transmission of currency shocks**



**Table A3: Exchange rate regimes and compatibility with the ERM II**

	<b>Ex. rate regime</b>	<b>Currency</b>	<b>Features</b>	<b>Compatibility with ERM II</b>
<b>Currency board</b>				
Estonia	Currency Board to euro	Estonian kroon – EEK (euro 1 = 15.6466 EEK)	Peg to euro since 1999 (to DM before)	Yes. Estonia joined ERM II after acceding in June 2004.
Lithuania	Currency Board to euro	Lithuanian litas – LTL (euro 1 = 3.4528 LTL)	Peg to euro since 2 February 2002 (to US dollar from 1 April 1994 to 2 February 2002)	Yes. Lithuania joined ERM II in June 2004.
<b>Fixed peg</b>				
Latvia	Peg to the SDR basket of currencies	Latvian lats – LVL	Exchange rate bands $\pm 1\%$ of the central rate	No, but planning to join ERM II and to peg to euro on 1 January 2005.
<b>Pegged ex rates within horizontal bands (Unilateral shadowing of ERM II)</b>				
Hungary	Peg to euro	Hungarian forint – HUF (euro 1 = 284.1 HUF)	Peg to euro with $\pm 15\%$ fluctuation band. Parity changed to 284.1 from 276.1 as of 4 <sup>th</sup> June 2003.	Yes.
<b>Managed float</b>				
Slovak Republic	Managed float	Slovakian koruna – SKK	Euro as a reference currency. Foreign exchange market interventions.	No. Slovak Republic envisages participation to ERM II in the medium term.
Slovenia	Managed float	Slovenian tolar	Euro informally used as a reference currency	Yes. Slovenia joined the ERM II in June 2004.
Czech Republic	Managed float	Czech koruna – CZK	Floating regime since May 1997	No, but planning to join ERM II in the medium term.
<b>Free float</b>				
Poland	Free float	Polish zloty – PLN	Inflation targeting	No, but planning to join ERM II and to peg to euro soon.

Source: Pre-Acceding Economic Programs 2003, ECB, EC.

**Tab A4 Timing of ERM II and Euro adoption**

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
<b>Czech Republic</b>			ERM II			EMU
<b>Estonia*</b>	ERM II			EMU		
<b>Hungary</b>		ERM II			EMU	
<b>Lithuania*</b>	ERM II			EMU		
<b>Latvia</b>		ERM II			EMU	
<b>Poland</b>			ERM II			EMU
<b>Slovenia*</b>	ERM II			EMU		
<b>Slovak Republic</b>		ERM II			EMU	

\*27 June 2004

Source: *Deutsche Bank Research, ECB*