



ISTITUTO DI STUDI E ANALISI ECONOMICA

**“HAS TRADE STRUCTURE ANY IMPORTANCE IN THE
TRANSMISSION OF CURRENCY SHOCKS? AN EMPIRICAL
APPLICATION FOR CENTRAL AND EASTERN EUROPEAN
ACCEDING COUNTRIES TO EU”**

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ABSTRACT

The object of this study is to assess the role of trade structure and firms pricing behaviour 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 Acceding countries (CEEACs) to EU.

According to our results, data seem to suggest that, with an export similarity index of over 80 and low pass-through, the most vulnerable countries to a devaluation arising in Slovak Republic, Latvia and Estonia, respectively, are Czech Republic, Estonia, Hungary, Poland, Slovak Republic and Slovenia. Nevertheless, Slovenia, Hungary and Poland, having a very high pass-through and a high share of bilateral trade within a region, can actually limit the extent of beggar-thy neighbour effects while the opposite applies to the remaining countries. Furthermore, Estonia, 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 also somewhat more exposed to external demand shocks originating from third countries.

JEL Classification Codes: F31, F32, F41

Keywords: Currency crises, Trade, Contagion

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SUMMARY

The object of this study is to assess the role of trade structure and firms pricing behaviour 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 Acceding countries (CEEACs) to EU.

I intend to interpret the interactions that the Centre-Periphery model (Corsetti et al. 1998b) identifies for Periphery countries as a possible description of interdependencies existing among CEEACs. *“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”*. These effects are emphasized by a high degree of export similarity among the countries in the Periphery.

The choice to focus on CEEACs is due to three main reasons: (i) they have a high degree of trade integration with EU and intra regional trade, (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) as they are expected to join the ERM II, they are likely - with the exception of Hungary, Estonia and Lithuania showing a peg to euro and currency board agreements, respectively - to move, sooner or later, towards a less flexible exchange rate regime.

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

The CEEACs are highly open economies with a high degree of intra-regional trade and trade with the EU. Data seem to show that in Hungary, Poland and Slovenia there is a high degree of exchange rate pass-through on export prices. Under these conditions, if one of these countries devaluates, there is a large range of elasticity values according to which the other countries are better off by maintaining their peg to euro in response to the devaluation. In general, a devaluation in a given country, in the presence of some degree of pass-through and intra-regional trade, leads both to a worsening in the competitiveness of its main trade competitors and to a decrease in their exports in common markets. This might be, however, partially off-set by a positive effect on competitors via terms of trade improvement. The net effect depends on countries' relative export and import demand elasticities and consumption basket composition.

In the case of Estonia, Latvia and Slovak Republic, whereby the pass through is low, if a devaluation occurs, the intra-Periphery *beggar thy neighbour* effect, based on competition in the EU market, disappears. An additional intra-Periphery *beggar thy neighbour* effect, however, materialises via a deterioration of their competitors' (with high export similarity indexes) terms of trade.

According to our results, data seem to suggest that, with an export similarity index of over 80 and low pass-through, the most vulnerable countries to a devaluation arising in Slovak Republic, Latvia and Estonia, respectively, are Czech Republic, Estonia, Hungary, Poland, Slovak Republic and Slovenia. Nevertheless, Slovenia, Hungary and Poland, having a very high pass-through and a high share of bilateral trade within a region, can actually limit the extent of beggar-thy neighbour effects while the opposite applies to the remaining countries. Furthermore, Estonia, 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 also somewhat more exposed to external demand shocks originating from third countries.

“LA STRUTTURA COMMERCIALE HA QUALCHE IMPORTANZA NELLA TRASMISSIONE DEGLI *SHOCK* VALUTARI? UN’ANALISI EMPIRICA PER LE NAZIONI DELL’EUROPA CENTRO ORIENTALE IN INGRESSO NELL’UNIONE EUROPEA”

SINTESI

Scopo di questo lavoro è cercare di verificare il ruolo della struttura commerciale nella trasmissione degli *shock* valutari tra nazioni appartenenti alla stessa regione geografica. L’analisi si concentra sull’identificazione e il confronto del grado di vulnerabilità ai disturbi valutari degli Stati dell’Europa Centro Orientale in ingresso nell’Unione Europea (*Central Eastern European Acceding countries, CEEACs*).

Dall’analisi dei dati emerge che, con indici di similarità delle esportazioni superiori a 80 e un basso *pass-through* del tasso di cambio, le nazioni più vulnerabili a eventuali svalutazioni che si verificano nella Repubblica Slovacca, Lettonia e Estonia (che sono i paesi più “contagiosi”) sono Repubblica Ceca, Estonia, Ungheria, Polonia, Repubblica Slovacca e Slovenia. Tuttavia, Slovenia, Ungheria e Polonia, che sembrano avere un *pass-through* molto alto in presenza di un intenso commercio intra regionale, dovrebbero limitare l’effetto di *beggar thy neighbour*, mentre il contrario accadrebbe per le rimanenti due nazioni.

Classificazione JEL: F31, F32, F41

Parole chiave: crisi valutarie, commercio, contagio.

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INTRODUCTION

The object of this study is to assess the role of trade structure and firms pricing behaviour 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 Acceding countries (CEEACs) to EU.

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.

In the analysis that follows the Periphery will consist of the group of CEECs (Central Eastern European countries) acceding to EU. I 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. I will build trade indicators for CEEACs and use them to gauge how specific features of their trade structure could affect the vulnerability to exchange rate shocks.

Following accession to EU, CEEACs 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 CEEACs should go through the ERM II mechanism 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 CEEACs will have eventually to change their exchange rate regime since at the moment the most of them there are experiencing a relatively more floating one.

The choice to focus on CEEACs is due to three main reasons: (i) they have a high degree of trade integration with EU and intra regional trade, (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) as they are expected to join the ERM II, they are likely - with the exception of Hungary, Estonia and Lithuania showing a peg to euro and currency board agreements, respectively - to move, sooner or later, towards a less flexible exchange rate regime.

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

The paper is organised as follows. In the first chapter sections I.1, I.2 and I.3, survey the theory and empirics of the transmission of crises via trade links. Relationships between trade features and vulnerability to shocks in a Centre-Periphery framework are described in section I.4. In the second chapter (sections I.1, I.2, I.3, I.4) indicators of vulnerability linked to trade structure for CEEAC's are built. Some preliminary results on relation between trade structure and currency shocks transmission are presented in the last paragraph.

I TRANSMISSION OF CRISES VIA TRADE LINKS: THEORY AND EMPIRICS

I.1 "Contagion": some conceptual and empirical issues

The study of international transmission mechanisms has attracted a renewed interest after the Asian crises¹, whose general feature was their propagation from one or some countries to whole regions (i.e. contagion). After 1997 a large body of theoretical and empirical literature² has focused on identifying economic and financial variables that prior to a crisis differ significantly between crisis and non crisis countries.

¹ Prior to the East Asian financial crisis there was relatively little analysis of why country-specific crises may spread internationally. A few economists had considered these issues after the departure of several European countries from the Exchange Rate Mechanism (ERM) in 1992 and after the Mexican Peso crisis in 1994.

² For a survey see Claessens, Dornbush and Park (2001).

Determining whether contagion has occurred during a specific period is complicated by a number of econometric issues. Furthermore isolating the channels through which crises are transmitted is made problematic by the interactions among various propagation mechanisms. Data availability often aggravates both of these difficulties. It should be emphasized, moreover, that there is not even consensus on exactly how contagion should be defined.

Forbes and Rigobon, in 1999, proposed a restrictive definition of contagion: the "shift contagion". According to the authors this definition is useful in evaluating the effectiveness of international diversification, justifying multilateral intervention, and differentiating among various transmission mechanisms (i.e. crisis-contingent theories, non-crisis-contingent theories)³.

Crisis-contingent theories are those that explain why transmission mechanisms change during a crisis and therefore why cross-market linkages increase after a shock. Non-crisis-contingent theories assume that transmission mechanisms are the same during a crisis as they are in more stable periods, and therefore that cross-market linkages do not increase after a shock. Evidence of shift contagion would support the group of crisis-contingent theories, while no evidence of shift contagion would support the group of non-crisis-contingent theories.

Forbes and Rigobon (2001) have shown that, although tests for contagion appear straightforward, they are biased because of the presence of heteroscedasticity, endogeneity and omitted variables. Pesaran and Pick (2003) Corsetti et al (2002), Forbes and Rigobon (1999), Rigobon (1999) and Lomakin and Paiz (1999) have corrected empirical works for each of these problems, finding that in most cases no (shift) contagion has occurred in recent crises. These studies show that large cross-market linkages after a shock are simply continuations of strong transmission mechanisms that exist as interdependences.

This result suggests that there is little support for crisis-contingent channels and prompts us to turn to non-crisis-contingent theories. The non-crisis-contingent theories identify financial markets, banking sector and trade as the main channels of economic disturbances transmission - which are not mutually exclusive - because of their role of links among different countries. Thus after accounting for the effects of financial factors financial and currency crises spread along the lines of trade linkages.

This paper concentrates on trade linkages as a channel for spreading the effects of economic disturbances and in particular currency crises. The choice is due to the decision of studying CEEACs. In fact, in these countries the financial

³ See Forbes and Rigobon (2001).

markets and the banking sector are not yet fully developed and integrated providing trade linkages with a major role in transmitting the shocks.

Furthermore, recent empirical studies ((Forbes (2001), Kaminsky and Reinhart (2000), Caramazza et al. (1999), Glick and Rose (1998), Eichengreen, Rose and Wyplosz (1996)) have found strong evidence to support the hypothesis that currency and financial crises spread from one country to another because of trade linkages.

I.2 The theoretical literature

Theoretical and empirical investigation into the role of trade channels has to date been rather limited in its scope. In particular, the relevance of trade has often only been considered by empirical analyses:

To explain why crises tend to be regional, some recent theoretical models⁴ 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).

The 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. The income effect operates through the 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)⁵. Both

⁴ See Bentivogli and Monti (2001) for a complete survey which include a further three, sometimes overlapping, categories: (i) models with strategic interactions (ii) models which examine the characteristics of trade structure, (iii) models which emphasize geography.

⁵ The latter constitutes the theoretical basis for the empirical application that I intend to conduct in this paper and it will be thoroughly discussed in section I.4.

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.

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.3 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 crisis⁶ – 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.⁷

Eichengreen et al. also substituted W_{ij} with a weight measuring relative macroeconomic similarity. This weight is closer to one the more similar are the standardized growth rates of the relevant macroeconomic variables. $I(L)_{i,t}$ is an information set of contemporaneous and lagged macroeconomic variables. Eichengreen et al. estimated the equation by using a probit model with quarterly data. 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 ω 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 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 crisis⁸ plus a proxy for trade effect:

$$\text{Crisis}_{i,t} = \alpha TC_{ij,t} + \beta FC_{i,t} + \gamma M_{i,t} + \varepsilon_{i,t}$$

⁶ 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

⁷ IMF weights consider only trade in manufacturing and are time invariant. For a detailed description of the methodology see IMF, *International Financial Statistics*.

⁸The 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.

The proxy TC is a weighted average of the price and income effects expected to spread from devaluation in a partner country. 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. Caramazza et al. adjust it to exclude own-country effects by replacing the actual exchange rate change and inflation of country i during the crisis with a projection based on trends over the three years previous to the crisis.

The income effect is captured by an indicator of the expected output contraction of countries which are export markets for country i . The output contraction is measured with respect to the average growth rates in the three years before the crisis, and trade weights are used to aggregate the data. FC is a set of indicators of financial linkages including the share of debt borrowed by country i from a common creditor country, and M_i is a set of macroeconomic variables.

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.

Another interesting finding by Caramazza et al. is that region-specific dummies are not significantly different from each other. This suggests that the clustering of crises is explained by the independent variables and therefore that crises are not strictly regional phenomena.

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:

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

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 also use other indicators: *Direct Trade*, *Total Trade* and *Trade Share*, which they define respectively as follows:

$$\text{DirectTrade}_i = 1 - \frac{|x_{i0} - x_{0i}|}{(x_{i0} + x_{0i})}$$

$$\text{Total Trade}_i = \left[1 - \frac{|x_{i0} - x_{0i}|}{(x_{i0} + x_{0i})} \right] * \text{Trade} + \text{DirectTrade}_i * \left[\frac{(x_{i0} + x_{0i})}{(x_0 + x_i)} \right]$$

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

Direct Trade is a measure of bilateral trade, *Total Trade* is a weighted index of bilateral trade and with respect to the third market, and *Trade Share* is an index similar to *Trade* but adjusted for trade shares to control for the different sizes of the countries. These measures seem to be relatively insensitive to the way in which trade linkages are measured.

Glick and Rose (1998) 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 phenomena⁹.

(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

⁹ 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.

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.

Taking indicators of trade structure into account, Diwan and Hoeckman (1999) test the hypothesis of competition-versus-complementarity for East Asian countries by using a set of trade indicators. They analyse intra- and inter-regional demand linkages by calculating shares of intra-extra regional trade of each country and a trade intensity index (XI) on both total merchandise exports and intermediate goods defined as:

$$XI_i = (X_{ij}/X_i) / [M_j / (M_w - M_i)]$$

where: X and M are respectively exports and imports, and i, j and w denote the reporting country, the partner and the world. If this index control for the size of the partner country is greater than 1, trade is more intense than would be expected, given a share j of world imports. This index has the defect that it allows neither cross-country nor cross-time comparisons. Moreover, it is sensitive to the size of country i : the bigger the country, the lower the index.

In order to test the competition hypothesis, Diwan and Hoeckman compute export correlations and export similarity indexes for extra- and intra-regional trade¹⁰:

$$XS_{ij} = \sum_a [\min(x_{ai}, x_{aj})] * 100$$

where: x_{ai} and x_{aj} are the industry a exports shares in country i 's and j 's total exports, calculated at the 4 digit SITC level.

The index ranges between 0 and 100, with 0 indicating complete dissimilarity and 100 identical export composition. The authors find a high degree of intra-regional trade in total and intermediate goods, supporting the close interdependence and complementarity hypothesis of East Asian trade¹¹.

¹⁰ This measure was first proposed by Finger and Kreinin (1979).

¹¹ According to Bentivogli and Monti (2001), "Diwan and Hoeckman's account is unsatisfactory in relating the trade structure to the transmission of crisis. As the "new trade theories" explain, countries which export very similar goods will have a large amount of bilateral (intra-industry) trade, so that competition will be strong both in regional markets and outside the region. This pattern of trade is typical of all industrial countries and of some emerging market economies as well. Diwan and Hoeckman's "competition story" probably only applies to a region in which all countries export largely the same raw materials, so that bilateral trade is limited and competition in third markets is high."

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.

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.

Forbes (2000) utilizes firm-level information to measure the importance of trade in the international transmission of crises. 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. 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 cheap-import effect, when a crisis reduces import prices and acts as a positive supply shock.

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. Although trade linkages only partially explain stock market returns during recent crises, they are significantly and economically important.

Bentivogli and Monti (2001) concentrate on trade linkages as a channel for spreading the effects of economic disturbances, from one "source" country to other countries. They compare the degree of vulnerability to external shocks of five Latin American countries and five Asian crisis countries in the 1990s computing theoretically-backed indicators of vulnerability due to trade linkages.

The indexes show that Latin America is much less vulnerable than Asia to an international transmission of economic disturbances from a country in the same region. This is due to: (i) the relatively lower openness of Latin American countries, (ii) the higher share of raw materials in their exports and (iii) the lower degree of similarity both of the manufactures exported inside their region and of those exported to their common industrial markets.

Moreover, South-east Asian countries are more likely than Latin American ones to transmit economic disturbances to industrial countries due to the higher substitutability of their manufactured exports with those of more advanced economies.

I.4 Trade features and vulnerability to currency shocks in a Centre-Periphery framework

Previous sections have shown that one of main shortcomings of the literature on the transmission of crises via trade is the fact that empirical studies are not closely linked to the theoretical literature.

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 CEEACs vulnerable to currency shocks given their trade structure.

Among the theoretical models, the one suited to this purpose seems to be the Centre-Periphery model (C-P) developed by Corsetti et al. (1998b). Under

certain hypotheses these authors reject the traditional hypothesis that devaluations have negative welfare 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 important 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.

The model assumes differentiated products, high substitutability among domestic varieties ($\theta > 1$) and among the varieties produced by A and B. ψ defines the elasticity of substitution between A and B, and ρ that between C and P (A+B). 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. $\rho \leq \psi$.¹²

(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.

Tab.1 Pass-through and firms pricing behaviour

Currency movement	Pass-through	Firms’ pricing behaviour
Depreciation/Devaluation	No pass-through	Skimming pricing
	Full pass-through	Penetration pricing
Appreciation/Revaluation	No pass-through	Penetration pricing
	Full pass-through	Skimming pricing

Source: Sundaram and Mishra (1992).

If the exchange rate is reflected in a one-for-one change in prices abroad, then it is referred to as “full pass-through” or no pricing to market¹³. If none of the exchange rate change is reflected in prices abroad it is referred to as “no pass through” or pricing to market.

In case of no pass through (price are set in the buyer’s currency rather than the seller’s currency) “*country B has always an incentive to abandon its peg to the Centre in response to country’s A devaluations, as its consumption utility does*

¹² With full pass-through if $\rho > 1$, after a devaluation in A the Periphery runs a current account surplus, while C experiences a current account deficit and a contraction in output. If also $\psi > 1$, the improvement in A’s current account will be greater than that of B’s current account (or equal to it in the case of matching devaluation).

¹³ Krugman (1986).

not change but its labour effort disutility worsens.” Corsetti et al. show that there are no relative price effects, in supply, while a monetary shock anywhere in the world economy affects output symmetrically in each country. If country B does not expand its money supply with the others, that country is unambiguously worse off, as its resident work more and consume less.

The consumption gains from a devaluation accrue exclusively to the country that devalues (because of the increase in the real value of its export revenues in which are set in buyers currency), while the cost of devaluation in terms of increased labour effort are spread worldwide.

Tab.2 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
 ψ elasticity of substitution between Periphery goods,
 ρ elasticity of substitution between Centre and Periphery goods.

Country A’s devaluation is beggar thy-neighbour as it reduces exports, revenues and profits of producers abroad (in B and in C). The non-devaluing countries whose export revenues fall are required to work more to sustain the initial level of consumption. 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.

(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.

With full pass-through and a monetary stabilization policy¹⁴ in B, 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 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 affects 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 improvement¹⁵. With no pass-through country B has always an incentive to abandon its peg to the Centre in response to country A's devaluation.

“Thus 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” (Corsetti et al. (1998b)).

¹⁴ Corsetti et al. consider three policy choices of country B: (i) monetary stabilization (i.e. the money supply is kept constant), (ii) defence of the peg with C's currency, and (iii) devaluation of the exchange rate that keeps A's and B's competitiveness in C's market unchanged.

¹⁵ This does not happen only when the Periphery as a whole loses against the Centre. Indeed, if ψ and θ are very close, A and B's relative market shares are very sensitive to price variations, so that A's devaluation redistributes welfare from B to A. On the other hand, the Periphery may obtain a welfare loss from A's devaluation. This happens if the share of Periphery goods in world consumption (γ_p) is small, if domestic markets are sufficiently competitive (θ is sufficiently large), and if products are poor substitutes for C products (ρ is sufficiently small).

II. TRADE STRUCTURE AND CURRENCY CRISES TRANSMISSION

II.1 Why analyse the CEEACs case?

The CEEACs are a group of geographically close countries in the “periphery” of the European Union.

Tab.3 Exchange rate regimes and compatibility with the ERM II

	Ex. rate regime	Currency	Features	Compatibility with ERM II
Currency board				
Estonia	Currency Board to euro	Estonian kroon – EEK (euro 1 = 15.6466 EEK)	Peg to euro since 1999 (to DM before)	Yes. Estonia will join ERM II after acceding in 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 is planning to join ERM II.
Fixed peg				
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.
Pegged exchange rates within horizontal bands (Unilateral shadowing of ERM II)				
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 th June 2003.	Yes.
Managed float				
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	No. Slovenia intends to enter the ERM II in the first half of 2005.
Czech Republic	Managed float	Czech koruna – CZK	Floating regime since May 1997	No, but planning to join ERM II in the medium term.
Free float				
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.

All the eight CEE countries that will join the EU on May 2004 have declared their intention to adopt the euro as early as possible¹⁶.

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 II¹⁷ 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 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.

Hungary and Slovak Republic are those that have most closely managed the exchange rate vis-à-vis the euro, in the first case via a peg to the euro and in the former case via unilaterally shadowing a type of ERM II framework. Therefore, they might consider to substantially continue present arrangements and to join the ERM II immediately after EU acceding, provided that fiscal imbalances are being contained (Tab. 1 in the Appendix).

For the Czech Republic and Poland, it may be preferable to maintain their current floating exchange rate regime for some time after EU entry, as inflationary targeting in these countries has overall proved a well-functioning framework for monetary policy and has delivered the primary objective of low inflation.

¹⁶ 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.

¹⁷ The ERM II is a pegged but adjustable system in which central parities are defined against the euro and not between all other participating countries. Hence this bilateral nature is expected to reduce the frequency and the scope of interventions. Central rates and fluctuation bands are set by common agreement involving the ministers of euro zone, the SECB governors of the AC. The standard fluctuation band is $\pm 15\%$ while not excluding the possibility of setting a narrower band. Intervention support of the ECB to NCB is automatic at the margins of the band (marginal interventions), any interventions within the band (intra-marginal intervention) need not to be (but may be) supported by the ECB. Finally realignments of central parity are made by the common procedure, which both the ECB and the member States have the right to initiate.

In the case of Estonia, Latvia, Lithuania and Slovenia the decision to join the ERM II soon and to adopt the euro after a short stay in ERM II may not run counter to substantial objections. In fact, these countries have already renounced to an autonomous monetary policy and they have managed to accommodate their catching up process without using the exchange rate as an adjustment tool. Furthermore, fiscal deficit are contained, public debt is small and structural policy have been supportive (Tab.1 in the Appendix).

The eight acceding 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 acceding 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 companies¹⁸.

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 CEEACs case is of great interest to study the transmission of currency shocks via trade, for three main reasons:

(i) The CEEACs are going to join the ERM II and eventually the EMU, abandoning (with the exception of Hungary, Estonia and Lithuania) flexible exchange rate as effective instrument for absorbing real shocks.

(ii) The CEEACs are a group of geographically close countries. They have a high degree of intra-regional trade and trade integration with European Union. It is possible to interpret the interdependences existing among them as the interaction that the C-P model identifies for periphery countries.

(iii) The CEEACs' financial markets are not yet 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.

¹⁸ ECB, (2003), An analytical review of the acceding countries strategies towards the adoption of the euro and the ERM II, Internal Staff paper, March.

This paper tries to answer to two main issues: (i) has the trade structure of CEEACs 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 CEEACs which is the probability of a contagious devaluation in the other countries in the group?

II.2 Trade integration with EU and intra regional trade

GDP income levels in CEE acceding countries are still well below those in EU with GDP per capita hovering at around 24.6% of the EU 15 average in PPP terms, ranging from 19% in Slovak Republic to 47.7% in Slovenia (see table 2a in the appendix).

Tab.4 Degree of openness and trade integration CEEACs
(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
Czech Rep.	94.9	60.8	0.64	68.3	60.1
Estonia	133.3	82.8	0.62	68.0	57.9
Hungary	91.1	59.4	0.65	75.1	56.3
Latvia	75.7	57.2	0.76	60.4	84.1
Lithuania	92.1	43.3	0.47	49.6	45.2
Poland	42.3	27.4	0.65	68.7	61.7
Slovak Rep.	109.4	60.2	0.55	60.5	50.3
Slovenia	97.3	62.1	0.64	59.4	68.0
Average	92%	56.7%	0.62	63.7%	60.5%

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

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 (further strengthened by the Association Agreement signed bilaterally by those countries) led to a huge increase of their market shares in EU trade¹⁹.

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 CEEACs entertain close trade relations with the EU, accounting on average for about 63.7% of total export and about 60.5% of total import (tab. 4). 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.

¹⁹ Zaghini (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 acceding countries confirms that the EU is the main market of destinations, USA and Japan having a minor role as export markets.

Tab.5a Bilateral export shares by destination
(Total exports %, 2002)

Partner Report	Czech Rep.	Hungary	Poland	Slovak Rep.	EU	USA	JAP	World
Czech Rep.		2.4	4.7	7.7	68.3	2.9	0.4	100
Hungary	1.9		2.1	1.4	75.1	3.5	0.6	100
Poland	4.0	2.3		1.4	68.7	2.7	0.2	100
Slovak Rep.	15.2	5.4	5.3		60.5	1.4	1.0	100

Source : OECD, Bilateral Trade Database (BTD) and International Trade by Commodity Statistics (ITCS), 2003.

Among the eight countries (tab.5a and 5b) trade shares with the other CEE acceding 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 OECD countries (Czech Republic, 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.

Table 3a in the appendix lists the first ten export markets for each of the four acceding countries in the area members of OECD. It confirms that EU countries are the main export market for all of them. Germany, in particular, is the main export market with very high export shares: 32.5% on average. On the contrary, the US has a modest importance as market of destination for Czech Republic, Hungary and Poland and it is not even in the rank of the first ten export markets for Slovak Republic.

The tables 4 in the appendix list the first five products exported according to SITC Rev 3 by each of the eight countries and provide an indication of the market power in EU for each sector.

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 CEEACs.

Tab.5b Bilateral export shares by destination
(Total exports %, 2002)

Partner Report	Estonia	Latvia	Lithuania	Slovenia	EU	USA	JAP	World
Estonia		6.00	3.2	0.05	60.04	2.16	0.64	100
Latvia	7.72		12.6	12.6	67.25	4.34	0.80	100
Lithuania*	4.13	8.35		0.33	63.1	3.8	0.40	100
Slovenia	0.02	0.08	0.00		66.16	2.75	0.15	100
Partner Report	Czech Rep.		Hungary		Poland		Slovak Rep.	
Estonia	0.30		0.58		0.5		1.83	
Latvia	0.99		0.17		0.3		1.79	
Lithuania*	0.84		1.56		6.3		2.78	
Slovenia	0.10		0.37		0.1		0.10	

*2001

Source: our calculation on United Nations, Comtrade 2003.

A large part of CEEACs 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 6 shows the Glick and Rose (1998) Trade share and Direct trade indexes measuring respectively competition in third market (EU) and direct trade linkages of CEEACs.

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 CEEACs 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.6 Glick and Rose trade linkages*
(2002)

Countries pairs	Competition in third markets (EU) (TradeShare ²⁰ SITC Rev.3)		Direct linkages (Direct trade ²¹ , SITC Rev.3)	
	Total	Manufactures	Total	Manufactures
ee-lv	0.59	0.69	0.58	0.59
ee-sk	0.62	0.72	0.85	0.53
ee-sl	0.62	0.70	0.32	0.27
ee-hu	0.68	0.78	0.74	0.48
ee-pol	0.66	0.76	0.51	0.55
ee-cz	0.65	0.74	0.52	0.41
cz-lv	0.67	0.81	0.36	0.31
cz-sk	0.65	0.81	0.85	0.80
cz-sl	0.65	0.83	0.87	0.93
cz-hu	0.71	0.79	0.83	0.81
cz-pol	0.68	0.79	0.94	0.86
hu-lv	0.73	0.99	0.22	0.27
hu-sk	0.70	0.96	0.78	0.83
hu-sl	0.70	0.98	0.76	0.90
hu-pol	0.72	0.92	0.89	0.86
sl-sk	0.58	0.69	0.92	0.97
sl-pol	0.66	0.73	0.62	0.56
sl-lv	0.57	0.66	0.27	0.26
pol-sk	0.66	0.88	0.83	0.79
pol-lv	0.68	0.89	0.24	0.24
sk-lv	0.59	0.72	0.51	0.43

*2002 data for Lithuania are not available

Source: our calculation on United Nations, Comtrade 2003.

The same result does not hold for intra-regional trade. In fact, the Direct trade indexes show that all the CEEACs compete against each others with few

²⁰ Trade Share_{ei} = $\sum_k \{ [(x_{0k} + x_{ik}) / (x_0 + x_i)]^* [1 - (x_{0k}/x_0) - (x_{ik}/x_i)] / ((x_{0k}/x_0) + (x_{ik}/x_i)) \}$ •where: x_{ik} = export from i to k (k ≠ i, 0), 0 first victim country, x₀ 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.

²¹ DirectTrade_{ei} = $1 - (|x_{i0} - x_{0i}| / (x_{i0} + x_{0i}))$. This index is higher the more equal are bilateral export between countries 0 and i.

exceptions (Estonia-Slovenia, Hungary-Latvia, Slovenia-Latvia and Poland-Latvia). However the degree of competition, if only trade in manufacture is considered, does not increase but instead, it decreases in more than half of country pairs.

II.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 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.7a Indexes of export similarity: the Finger and Kreinin index²²
(On manufactures in % of manufactures export, 2002, export market EU, SITC)

	Estonia	Hungary	Latvia	Lithuania	Poland	Slovak Rep	Slovenia
Czech 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
Slovak Rep.							93.4

Source: our calculation on New Cronos Eurostat.

One simple measure of the substitutability of each country's export is the Finger and Kreinin index²³.

Table 7a and 7b show 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 European Union.

²² •ES_{ij} = Σ_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. •ES = 0 = complete dissimilarity, ES = 100 = identical export composition

²³ 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.

The indexes show a high degree of similarity among the CEEACs, 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.

Tab.7b Indexes of export similarity: the Finger and Kreinin index

(On manufactures in % of manufactures export, 2001, export market EU, ISITC Rev.3)*

	France	Germany	Italy	UK
Czech Rep.	66.2	72.7	67.9	72.1
Hungary	62.0	68.5	60.2	75.3
Poland	71.2	65.5	64.6	55.4
Slovak Rep.	71.3	68.7	68.7	60.4

*2002 and homogeneous data SITC Rev.3 for Estonia, Latvia, Lithuania and Slovenia are not available.

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

In table 7b, we report the Finger and Kreinin indexes, calculated for those acceding countries, which are OECD members and the first four European competitors in the EU. On the basis of the indexes values, the assumption of Corsetti et al. (1998), according to which the elasticity of substitution between Centre and Periphery goods is lower than or equal to that between Periphery goods (i.e. $\rho \leq \psi$), seems to be true (at least) for these four countries²⁴.

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

²⁴ This analysis has not extended to the other four acceding countries due to lack of homogeneous data.

Let e be the nominal exchange rate, P^F the foreign firm's price level expressed in domestic currency terms, with the foreign currency price being P^F/e , the phenomenon of pass through can be, therefore, expressed by dP^F/de .

Alternatively, a more convenient way of expressing the pass through is by computing the price elasticity in the form $(dP^F/de)(e/P^F)$. In case the latter elasticity equals 1, the full pass through condition holds, while no pass through arises in case of $(dP^F/de)(e/P^F) = 0$.

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.

Tab.8 Correlation between the export price index and the exchange rate against the euro
(quarterly data, Q1-1999-Q4-2002)

	Czech Rep.	Hungary	Poland	Slovak Rep.
Correlation coefficient	0.2	0.9	0.8	-0.1
Average elasticity	0.3	1	0.9	0.1

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

	Estonia	Latvia	Lithuania	Slovenia
Correlation coefficient	0.0	-0.0	0.5	Hps *Coricelli, Zsolt PT=1
Average elasticity	0.0	-0.2	0.4	

* Quarterly export price index data for Slovenia are not available

Source: Datastream

In line with the scope of our work, we use a simple measure of exchange rate pass-through on export price²⁵ based on correlation coefficients and average price elasticity to exchange rate (Table 8).

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. This firm policy in case of appreciation of the

²⁵ It is worth noting that, however, our simple estimates are in line with recent more sophisticated studies on exchange rate pass-through in these countries.

national currency against the euro implies a “skimming” pricing strategy while in case of depreciation a “penetration” or “market share” pricing strategy²⁶.

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.

These results are roughly 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.

Tab.9a Currency shock vulnerability of CEEACs (2002)

PassThrough ψ	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				

²⁶ Sundaram and Mishra (1992).

SOME PRELIMINARY RESULTS

The CEEACs are highly open economies with a high degree of intra-regional (periphery) trade and trade with the EU (centre).

According to the Corsetti et al. model, in case of no pass-through, 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 emphasized by the high degree of export similarity among CEEACs.

According to our findings, the elasticity of substitution among CEEACs' goods is higher than the one among EU and CEEACs goods - which is high anyway, and also intense intra- Periphery trade occurs.

Data show that in Hungary, Poland and Slovenia there is an high degree of exchange rate pass-through on export prices. Given these conditions, if one of these countries devaluates there is a large range of elasticity values for which the other countries are better off by maintaining their peg in response to the devaluation.

In fact, a devaluation in a country, in the presence of some degree of pass-through and intra-regional trade, leads to a worsening in competitiveness of trade competitors and to a decrease in their exports in common markets. On the other side, there is also a positive effect on competitors via terms of trade improvement.

In the case of Estonia, Latvia and Slovak Republic, in which the pass-through is zero, if a devaluation occurs the intra-Periphery beggar-thy-neighbour effect based on competition in EU market disappears. However there is a different intra-Periphery beggar thy neighbour effects, via a deterioration of their competitors terms of trade with high export similarity indexes.

Tables 9a and 9b summarise preliminary results on the vulnerability to currency shocks for all country pairs.

According to our results, data seem to suggest that, with an export similarity index of over 80 (or a Direct Trade index of over 0.5) and low pass-through, the most vulnerable countries to a devaluation arising in Slovak Republic, Latvia and Estonia (which are, according to our findings, the most contagious countries in the group) respectively, are Czech Republic, Estonia, Hungary, Poland,

Slovak Republic and Slovenia. Nevertheless, Slovenia, Hungary and Poland, having a very high pass-through and a high share of bilateral trade within a region, can actually limit the extent of beggar-thy neighbour effects while the opposite happens in the remaining countries.

Furthermore, Estonia, Czech and Slovak Republic, are relatively less integrated with the EU. The lower trade integration might suggest that these countries, which significantly trade also with non EU countries, could be also somewhat more exposed to external demand shocks originating from third countries.

Tab.9b Currency shock vulnerability of CEEACs (2002)

PassThrough Direct Trade*	0			0.2	0.5	0.8	0.9	1
	Sk	Lv	Ee	Cz	Lt	Pl	Hu	Sl
0.97	Sk-Sl							Sl-Sk
0.93				Cz-Sl				Sl-Cz
0.90							Hu-Sl	Sl-Hu
0.86				Cz-Pl		Pl-Cz, Pl-Hu	Hu-Pl	
0.83	Sk-Hu						Hu-Sk	
0.81				Cz-Hu			Hu-Cz	
0.80	Sk-Cz			Cz-Sk				
0.79	Sk-Pl					Pl-Sk		
0.59		Lv-Ee	Ee-Lv					
0.56						Pl-Sl		Sl-Pl
0.55			Ee-Pl			Pl-Ee		
0.53			Ee-Sk					
0.48			Ee-Hu				Hu-Ee	
0.43	Sk-Lv	Lv-Sk						
0.41			Ee-Cz	Cz-Ee				
0.31		Lv-Cz		Cz-Lv				
0.26		Lv-Sl						Sl-Lv
0.27		Lv-Hu	Ee-Sl				Hu-Lv	Sl-Ee
0.24		Lv-Pl				Pl-Lv		

*2002 data for Lithuania are not available

It has to be underlined that joining the ERM II for these countries will implies to have limited exchange rate flexibility in an environment of increasing trade and capital mobility. The large trade (and capital) flows and potential demand shocks that will be directed towards these economies are expected to exert pressures on domestic currencies. The open issues is whether in such a context a rigidity of the exchange rate could precipitate disorderly realignments with negative economic consequences, including those for the credibility of the mechanisms as a whole.

Due to heterogeneity in pass-through, trade composition and exchange rate regime across the countries in the area, it is extremely difficult derive a single policy implication on ERM II sustainability.

Nevertheless according to our preliminary findings, if currency shocks occur in one of the CEEACs, the likelihood of contagion spreading to all the region via trade is in some way contained by the fact that Hungary Poland and Slovenia have a very high degree of pass through.

APPENDIX

**Tab.1 Economic indicators in view of convergence criteria
(2002)**

	Inflation*	Fiscal balance (%of GDP)	Public debt** (%GDP)	Long term yields
Cipro	2.8	-3,5	59.7	5.1
Czech Rep.	1.8	-6.7	26.9	4.7
Estonia	3.6	1.3	5.8	n.a.
Hungary	5.3	-9.2	56.3	7.1
Latvia	1.9	-3.0	14.6	5.5
Lithuania	0.3	-1.7	22.7	5.1
Malta	2.2	-6.2	66.6	5.8
Poland	1.9	-3.8	41.8	7.6
Slovak Rep.	3.3	-7.2	44.3	7.1
Slovenia	7.5	-2.4	27.8	3.6

*Period average, CPI

**Liquid local gov bond are yet to be developed in many countries

Source:ECB, PEPs.

**Tab.2a Country size
(2002)**

	GDP based on PPP valuation of country GDP*	Population	GDP per capita current prices, US \$	GDP per capita current prices, Share of EU average (US \$, %)
Czech Rep.	160,843	10,209,830	6,784	29.16
Estonia	14,501	1,358,000	4,380	18.82
Hungary	135,907	10,166,000	6,646	28.57
Latvia	18,971	2,335,000	3,581	15.39
Lithuania	29,353	3,476,000	4,015	17.25
Poland	386,518	38,626,190	4,884	20.99
Slovenia	36,730	1,991,960	11,031	47.71
Slovak Rep.	63,849	5,408,760	4,389	18.86
EU-15 average	634,830	25,265,221	23,267	

*Current US \$ billions

Source: our calculation on World Bank, World development indicators (WDI), International Monetary Fund, World Economic Outlook Database, September 2003.

Tab.2b Country size
(2002)

	Gross domestic product based on purchasing-power parity (PPP) share of world total (%)	Share of world population (%)	Gross domestic product based on purchasing-power parity (PPP) Share of EU GDP (%)	Share of EU population (%)
Czech Rep.	0.33	0.16	1.69	2.69
Estonia	0.03	0.02	0.15	0.36
Hungary	0.28	0.16	1.43	2.68
Latvia	0.04	0.04	0.20	0.62
Lithuania	0.06	0.06	0.31	0.92
Poland	0.80	0.62	4.06	10.19
Slovenia	0.08	0.03	0.39	0.53
Slovak Rep.	0.13	0.09	0.67	1.43
EU-15 average	1.3	0.41		

Source: our calculation on World Bank, World development indicators (WDI), International Monetary Fund, World Economic Outlook Database, September 2003.

Tab.3a Main export markets CEE-4

Czech republic		Hungary		Poland		Slovak Republic	
(% world, ranking, 2002)							
Germany	36.45	Germany	35.42	Germany	32.31	Germany	26.03
Slovak Rep.	7.74	Italy	5.78	Italy	5.50	Czech Rep.	15.19
UK	5.73	France	5.66	UK	5.18	Italy	10.71
Austria	5.54	UK	4.70	Netherlands	4.49	Austria	7.66
Poland	4.74	Sweden	4.32	Czech Republic	4.00	Hungary	5.45
France	4.65	Netherlands	4.24	Russian Feder.	3.25	Poland	5.34
Italy	4.05	USA	3.49	Belgium	3.24	France	4.16
Netherlands	3.88	Belgium	2.69	Sweden	3.24	Netherlands	3.05
USA	2.86	Spain	2.39	Denmark	2.77	UK	2.38
Hungary	2.44	Poland	2.12	USA	2.68	Belgium	2.07

Source : OECD, Bilateral Trade Database (BTD) and International Trade by Commodity Statistics (ITCS), 2003.

Tab.3b Main export markets CEE-4

Czech republic		Hungary		Poland		Slovak Republic*	
(% world, ranking, 1995)							
Germany	31.9	Germany	28.7	Germany	38.3	Czech Rep.	25.5
Slovak Rep.	16.2	Austria	10.1	Netherlands	5.6	Germany	23.7
Austria	6.5	Italy	8.5	Russian Feder.	5.6	Austria	7.2
Poland	5.4	Russian Feder.	6.4	Italy	4.9	Italy	6.0
Italy	4.0	France	4.0	UK	4.0	Poland	5.2
Russian Feder.	3.5	USA	3.2	France	3.6	Hungary	4.5
Netherlands	2.7	UK	3.0	Czech Rep.	3.0	Russian Feder.	3.4
France	2.5	Netherlands	2.9	Denmark	3.0	France	2.4
UK	2.3	Poland	2.6	USA	2.7	Netherlands	2.0
Hungary	2.1	Belgium	2.0	Sweden	2.5	Belgium	1.7

*1997, 1995 not available

Source: OECD, Bilateral Trade Database (BTD) and International Trade by Commodity Statistics (ITCS), 2003.

**Tab.4 Export structure to EU by first 5 commodities at SITC Rev.3
(2002)**

	Product	SITC rev.3	% of total export
Czech Rep.	Total Manufactured goods	0-1+5-8	94.3
	Machinery and transport equipment	7	53.8
	Manufactured goods	6	21.8
	Miscellaneous manufactured articles	8	13.2
	Chemicals and related products	5	3.8
	Crude materials, inedible , except fuels	2	3.1
Estonia	Total Manufactured goods	0-1+5-8	84.8
	Machinery and transport equipment	7	33.9
	Miscellaneous manufactured articles	8	24.7
	Manufactured goods	6	20.5
	Crude materials, inedible , except fuels	2	13.5
	Food and live animals	0	3.8
Hungary	Total Manufactured goods	0-1+5-8	96.9
	Machinery and transport equipment	7	66.1
	Miscellaneous manufactured articles	8	14.2
	Manufactured goods	6	8.8
	Food and live animals	0	4.1
	Chemicals and related products	5	3.5
Lithuania	Total Manufactured goods	0-1+5-8	72.3
	Miscellaneous manufactured articles	8	32.6
	Mineral fuels, lubricants and related materials	3	19.9
	Machinery and transport equipment	7	17.3
	Manufactured goods	6	12.9
	Chemicals and related products	5	7.9
Latvia	Total Manufactured goods	0-1+5-8	63.7
	Crude materials, inedible , except fuels	2	35.0
	Manufactured goods	6	26.4
	Miscellaneous manufactured articles	8	19.2
	Food and live animals	0	12.0
	Machinery and transport equipment	7	4.7

(continues)

	Product	SITC rev.3	% of total export
Poland	Total Manufactured goods	0-1+5-8	92.2
	Machinery and transport equipment	7	41.4
	Manufactured goods	6	22.8
	Miscellaneous manufactured articles	8	18.7
	Food and live animals	0	5.2
	Mineral fuels, lubricants and related materials	3	5.1
Slovenia	Total Manufactured goods	0-1+5-8	97.4
	Machinery and transport equipment	7	44.8
	Manufactured goods	6	26.2
	Miscellaneous manufactured articles	8	20.4
	Chemicals and related products	5	4.7
	Crude materials, inedible , except fuels	2	2.0
Slovak Rep.	Total Manufactured goods	0-1+5-8	94.6
	Machinery and transport equipment	7	49.7
	Manufactured goods	6	22.3
	Miscellaneous manufactured articles	8	17.4
	Chemicals and related products	5	4.1
	Mineral fuels, lubricants and related materials	3	2.7

Source: our calculation on Eurostat, New Cronos.

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