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# Trade as international transmission mechanism of shocks: The case of Central Eastern European Countries

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# Introduction

## 1.1 Motivations

This research is aimed at studying the role of trade as international transmission mechanism of shocks. The study focuses on trade flows in the last decade as channels of transmission of currency shocks across the Central Eastern European "new" European Union (EU) members.

The poor understanding of the transmission of financial and currency crises in past years has prompted in the economic literature a surge of interest in international transmission mechanisms of shocks. Through a careful survey of the literature it is possible to draw some interesting findings on international transmission channels.

One important finding is that in most cases countries are highly "interdependent" in all states of the world. Therefore, the strong cross-country linkages that exist during a crisis are not significantly different than those prevailing during stable period. Moreover, the results of many empirical studies provided trade flows, among the other cross-country linkages, with a very important role in transmitting shocks internationally.

The choice of Central Eastern European countries (CEECs) as case study depends on several motivations. First CEECs are the main actors in the process of the EU enlargement. In the completion of the enlargement process the CEECs are going to join the ERM II and eventually the EMU, abandoning the possibility to use exchange rate as effective instrument for absorbing shocks.

The entry of the new Member States into EU prompted a broad debate on the choice of the optimal exchange rate strategy towards the ERM II and the euro. Therefore, at present the assessment of the potential sustainability of ERM II and the study of potential causes of CEECs vulnerability to currency shocks seem to be of particular interest from an economic policy point of view.

Second, the CEECs are very suitable for representing the Periphery of EU. They are a group of geographically close countries, they have a high degree of trade integration with EU and some intra periphery trade exists. Studying these countries as case study for the issue of international transmission of shocks within a Centre-Periphery model of devaluations seems to be appropriate. Furthermore, the study of an empirical case in the framework of a theoretical model allows to bridge the gap between theoretical and empirical analysis which is the main shortcoming in the existing literature.

Third the CEECs' financial markets and banking sector are not yet fully - developed and integrated providing trade linkages with a major role in transmitting shocks. Therefore these countries represent a case study suitable for analysing the transmission of currency shocks via trade linkages.

### 1.2 Structure of research

The research is divided in three chapters. The first chapter presents a survey of the existing literature on international transmission of financial and currency shocks with a focus on contagion. The second chapter is an assessment of the role of trade in the transmission of currency shocks across geographically close countries focusing on the case of CEE acceding countries, and the third chapter provides an estimate of the effects of EU eastwards enlargement process on trade patterns in the Enlarged EU.

In particular, the first chapter focuses on the recent debate concerning the definition of contagion. In literature there is not a uniform definition of what contagion constitutes. The idea that financial and currency crises cause structural breaks in international transmission mechanisms is opposed to the one that transmission mechanisms are the same during crises and during stable period.

According to recent econometric findings the increases in correlation coefficients of stocks, interest and exchange rates -which are qualified as contagion- are due only to the excess of volatility in the markets that is reflected in a bias upward in the results of the most common econometric tests. Therefore there was virtually no contagion during most of crises' episodes proving that countries are highly "interdependent" in all states of the world.

Studies by Forbes (2001), Kaminsky and Reinhart (2000), Caramazza et al. (1999), Glick and Rose (1998), Eichengreen, Rose and Wyplosz (1996) 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. Most of the above-mentioned empirical studies identify and measure 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.

Therefore, the object of the second part of this research is to assess the role of trade flows and trade structure in the transmission of currency shocks across geographically close countries. I interpret the interactions that a C-P model identifies for Periphery countries as a possible description of interdependencies existing among CEECs. The analysis focus on identifying and comparing the degree of vulnerability to currency shocks of CEECs.

The second part of the research points out that in a C-P framework (i.e. the enlarged EU) the patterns of trade flows, next to trade structure and exporter firms pricing policies, have a very important role in determining vulnerability to currency shocks.

The object of the third and last part of the research is to estimate the effect of EU eastwards enlargement process on trade patterns in the Enlarged Union. In particular, it investigates whether and how the European (Free Trade) Agreements (EAs) with CEECs have exerted a different impact on centre-periphery and intra-periphery trade relationships. This last part also evaluated if the "EU membership factor" has had anticipated additional positive effects for CEECs exports.

### 1.3 What is new in this research work

This work, next to a careful review of the existing literature, attempts to make the following contributions: (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 CEECs to derive policy implications on the sustainability and opportunity of the announced strategies towards the ERM II and the EMU. iv) it provides estimates of a gravity equation for CEECs'

trade flows using a "System GMM" dynamic panel data approach. The latter is a quite new estimate methodology allowing for the introduction of dynamics in panel data analysis.

### 1.4 Main findings

In the first chapter the analysis of the literature on international transmission of shocks pointed out several interesting issues:

i) The exact definition (and causes) of contagion are not known neither are the precise policy interventions that can most effectively reduce contagion and moreover according to different definitions, theories, empirical tests results and policy implications change.

ii) the still unresolved dispute concerning shift contagion versus interdependence is reflected in the division of the literature in two blocks: crisis contingent (shift contagion) theories and non crisis contingent (interdependence) theories. Next to the broad theoretical literature the extensive empirical literature could be generated by the attempt to give a solution at the shift contagion versus interdependence puzzle.

iii) in the empirical literature each of the papers that attempts to correct for heteroscedasticity, endogeneity and/or omitted variables shows that the bias from these problems affects estimates of contagion during financial crises episodes. These papers use a variety of different approaches, identification assumptions, and model specifications to adjust for one (or more) of these problems. They find that transmission mechanisms were fairly stable during crises. Since contagion is defined as a significant increase in cross-market linkages after a shock, this suggests that little contagion occurred during recent crises.

The second chapter shows that a theoretical framework provides suggestions on how to implement the empirical analysis of currency disturbances transmission via trade linkages. In particular, a centre–periphery scheme is used to analyse the potential vulnerability to currency shocks of CEECs in the framework of the EU enlargement process.

The results of the analysis points 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).

What emerges in the second chapter is that due to pass-through and trade structures heterogeneity, it is very difficult to derive for CEECs a unitary policy implication on ERM II potential sustainability. However seems to be possible to single out for which country pairs the incentive to transmit currency shocks is higher.

From the analysis emerges very clearly the important role of the direction of trade flows in a Centre-Periphery framework to explain the degree of vulnerability of countries to currency shocks. "*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" (Corsetti et al. 1998b).*

These findings underline the importance to investigate the effect of EU eastwards enlargement process on trade patterns in the enlarged EU. In particular, the third chapter shows that the Free Trade Agreements (FTAs) signed by CEECs have exerted a different impact on centre-periphery and intra-periphery trade relationships.

Being part of a FTA with EU15 countries (Eas) increased CEECs bilateral trade by more than 11%; intra-periphery agreements increased trade around 14.% on average. The relatively lower impact on export flows of EAs than intra periphery FTA could be explained by the fact that, starting from the end of the eighties, trade between CEECs and EU 15 was already intense because reduction of trade barriers have already taken place.

It is worth to notice that estimates results seem to support the evidence coming from the data (see paragraph II). Starting from a very low level, the rate of growth of intra-periphery trade has been higher than core-periphery trade, ceteris paribus, because of an higher FTA impact. From this perspective, trade agreements between centre and periphery did not hamper trade relationship among periphery countries (no "hub and spoke" effect).

For what concern the "EU membership factor", estimate results suggest that the trade flows coming from CEECs "embodied" in some cases the news of the future EU membership.

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# Chapter I

"*Contagion: A disease that can be communicated rapidly through direct or indirect contact*".

(Webster Dictionary)

## *Shift contagion or interdependence? An analysis of financial and currency crises' main transmission channels.*

**Introduction**

This chapter is aimed at surveying and analysing the literature on international transmission of shocks. It focuses on the recent debate on financial contagion which compares the hypotheses of interdependence and *shift contagion.*

In the last years during financial and currency turbulences initial country-specific shocks were rapidly transmitted to markets of very different sizes and structures. In crisis periods the cross market correlation seems to increase with respect to the one of more stable period.

The significant increase in cross-market linkages after a shock, the so-called contagion, imposed the problem to study if international transmission mechanisms of financial and currency shocks are the same during crisis and stable periods.

It is worth to notice that there is not yet in literature a uniform definition of what contagion constitutes. To the idea that during crises transmission

mechanisms change (*shift contagion*), is opposed the one that cross market linkages are the same that exist during more stable periods (interdependence).

If the econometric tests verify the shift contagion hypothesis it could have important repercussions on international investors and policy makers behaviour. First, if contagion occurs after a negative shock it would undermine much of the rationale for international diversification. Second, international institutions and policy makers worry that a negative shock to one country can have a negative impact on financial flows to another country—even if the fundamentals of the second economy are strong and there is little real connection between the two countries. This effect could lead to a financial or currency crisis, completely unwarranted by the country's fundamentals and policies, in the second country. If this sort of contagion exists, it could justify international organization intervention and the dedication of massive amounts of resource to stabilization funds.

The chapter is divided in four parts: The first part provides an overview of definitions and misconceptions concerning financial contagion, the second surveys the theory and empirics of contagion. In the third part empirical tests and econometric issues are examined, concluding remarks are presented in the last section.

## I.1 Contagion: definitions

Since the Asian crisis in 1997 the term contagion has been referred to the spread of financial turmoil across countries. Among economists there is little agreement on what exactly the term contagion entails. The exam of the literature provides three prevailing definitions:[1]:

i) Fundamental base contagion (interdependence): the contagion is the transmission of global or local shocks across countries through fundamentals (spillover effects). According to this definition contagion could arise also during stable periods, Calvo e Reinhart (1996), Pristker (2000));

ii) Excess of co-movements: the contagion is the transmission of global or local shocks across countries through mechanisms that not include fundamentals. This type of contagion is considered to be caused by

[1] Pericoli and Sbracia (2001) include five different definitions, the two missed in this paragraph are i) "*contagion is a significant increase in the probability of a crisis in one country conditional on a crisis occurring in another country*" and ii) "*contagion occurs when volatility spills over from the crisis country to the financial markets of other countries*".

"irrational" phenomena, such as financial panic, herd behaviour, increase in risk aversion or a loss of confidence (Claessens, Dornbusch, Park (2001), Jeanne and Masson (1998)).

iii) shift contagion: the contagion is a significant change in cross-market linkages after a shock to an individual country (or group of countries). (Forbes and Rigobon (1998)).

The transmission mechanisms underling the three definitions could be represented by the following model, partly taken from Forbes and Rigobon (1999), Pristker (2001) and Pericoli and Sbracia (2001):

$$x_{i,t} = \alpha_i + \beta_i X_t + \gamma_i a_t + \varepsilon_{i,t}$$

where:

$x_{i,t}$ is the stock price in country $i$ at time $t$,
$X_t$ is the vector of stocks prices $x_{j,t}$ in countries different from $i$ ($j \neq i$),
$a_t$ is a common aggregate shock linked to fundamentals, and
$\varepsilon_{i,t}$ is an idiosyncratic and independent shock.

On the basis of this equation, it is possible to show how transmission mechanisms work according to the three different definitions of contagion:

i) the first transmission mechanism of aggregated or specific shocks is measured by $a_t$ and $X_t$, and the direct effect of these shocks on each country $i$ is embodied respectively by $\gamma_i$ and $\beta_i$.

ii) the second transmission mechanism is measured by the correlation of idiosyncratic shocks of different countries $\varepsilon_{i,t}$, it is interpreted as contagion because there is excess of co-movements that cannot be explained by fundamentals;

iii) the third transmission mechanism is measured by a shift in cross-market linkages and therefore is embodied in changes in both parameters $\beta_i$ and $\gamma_i$ (i.e. structural break).

The first definition, as noticed by Claessens, Dornbusch and Park (2001), should not be properly considered as contagion. Therefore, it reflects the interdependence that exists in each state of the world among countries.

According to the interdependence definition, global or local shocks are transmitted internationally by financial or real channels[2].

The second definition, as noticed in Pritsker (2001)[3], presents two orders of problems: The first is that the finding of contagion can always be questioned on the basis that the correct set of fundamentals was not controlled for (i.e. omitted variables problem). The second is related to the possibility that contagion occurs through a channel that Kodres e Pritsker (2000) refer to as "cross market hedging".

In the cross market hedging models some operators receive information (information shock) about country-specific components. After the shock the informed operators will optimally alter their portfolio for the country where the shock occurred. But they will also hedge the change in their macroeconomic risk exposures by rebalancing in other countries. The rebalancing transmits the idiosyncratic shock across markets, generating correlation in short-run stock returns.

The third definition "*not only clarifies that contagion arises from a shift in cross market linkages, but it also avoids taking a stance on how this shift occurs*". As explained in Forbes and Rigobon (1999), the adoption of the shift contagion definition provides three types of advantages:

i) First, the test for shift contagion is a test of the effectiveness of international diversification in reducing the portfolio risk during a crisis. In fact, if shift contagion occurs after a negative shock it would undermine much of the rationale for international diversification.

ii) Second, the definition is useful in evaluating the role and potential effectiveness of international institution and bailout funds.

iii) Third, tests based on this definition provide a useful method to classify theories as those that entail either a change in propagation mechanisms after a shock (crisis-contingent theories) versus those which are a continuation of existing mechanisms (non crisis contingent theories).

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[2] The others two categories occur when the transmission of a crisis cannot be linked to observed changes in fundamentals and result solely from the behavior of investors or other financial agents

[3] "*I prefer a broad definition because the economics profession will probably never reach agreement on the appropriate set of fundamentals which are needed to make a narrow definition operational*"

## I.2 Theoretical and empirical literature

**I.2.1. *Shift contagion* or "*crisis-contingent*" theories:** Are those that explain why transmission mechanisms change during a crisis and therefore why cross-market linkages increase after a shock. They can be divided into three kind of models: i) multiple equilibria; ii) endogenous liquidity; iii) political contagion.

i) Multiple equilibria: This kind of models explains contagion as result of self fulfilling shifts in expectations.

Masson (1998) shows how a crisis in one country could coordinate investors' expectations, shifting them from good to a bad equilibrium for another economy and thereby spreading the crisis in the second economy. Mullainathan (1998) argues that investors imperfectly recall past events. A crisis in one country could trigger a memory of past crises, which cause investors to recomputed their priors and assign higher probability to a bad state. The resulting downward co-movement in prices would occur because memories and not fundamentals are correlated.

In both of these models – Masson and Mullainathan- the shift from a good to a bad equilibrium, and the transmission of the shock are due to a change in investors' beliefs and not to any real linkages. This kind of models was used to explain speculative attacks in countries with solid macroeconomic fundamentals (Radelet and Sachs 1998, Sachs, Tornell and Velasco 1996). However it is extremely difficult to test the assumptions of these models.

ii) Endogenous liquidity: These models explain contagion through the presence of liquidity constraints. During the Asian crisis the devaluation and the crash of the stock markets in Thailand caused strong losses in the capital account of many international investors. This losses could have given the incentive to international investors to sell assets in other emerging markets not in crisis to gather liquidity.

Valdés (1996) develops a model where a crisis in one country can reduce the liquidity of market participants. This could force investors to recompose their portfolios and sell assets in other countries in order to continue operating in the market, to satisfy margin calls or to meet regulatory requirements. Therefore, if the liquidity shock is large enough, a crisis in one country could increase the degree of credit rationing and force investors to sell their assets in countries not affected by the initial crisis.

Calvo (1999) develops a different model of endogenous liquidity. In his model, there is asymmetric information among investors. Informed

investors received signals about fundamentals of a country and are hit by liquidity shocks (margin calls) that force them to sell their assets.

Uninformed investors cannot distinguish between liquidity shocks and a bad signal, and therefore charge a premium where the informed investors are net sellers. This transmission mechanisms does not occurs during stable periods and only occurs after the initial shocks. In both models the liquidity shock causes an increase in the cross market correlation unexplained by fundamentals[4].

Two important implications of these models based on liquidity constraints are that i) the more country assets are traded on financial markets the more is the likelihood of contagion in this country. (Calvo and Mendoza (1998), Kodres and Pritsker (1998)). ii) Countries which assets have high degree of correlation with country hit by a crisis are more vulnerable to contagion (Kaminsky and Reinhart (1998), Allen and Gale (1998)).

iii) Political contagion[5]: this kind of models was not exclusively used to explain contagion in emerging markets, but also in mature markets. Drazen (1998) studies the European devaluations of 1992 and 1993 and develops a model assuming that central bank presidents are under political pressure to maintain their countries' fixed exchange rates. When one country decides to abandon its peg, this reduces the political costs to other countries of abandoning their respective pegs, which increases the likelihood of switching exchange rate regimes. As a result, exchange rate crises may be bunched together, and once again, transmission of the initial shock occurs through a mechanisms that did not exist before the initial crisis[6].

**I.2.2.*Interdependence* or "*non-crisis-contingent*" theories**: These theories assume that transmission mechanism after an initial shock are not significantly different than before the crisis. They can be divided into three kind of models: i) Trade and competitive devaluation, ii) Asymmetric information and policy co-ordination, iii) Random aggregate shocks.

i) Trade and competitive devaluation: These kind of models explains the transmission of financial and currency shocks through trade channel. When a crisis determines a large devaluation in one country, all main trading

[4] Kodres e Pritsker (1999) present a model similar to the Calvo's one. In the model there are four cathegories of agents: i) informed investors, ii) uninformed investors, iii) *liquidity traders*, iv) *noise traders.*

[5] Claessens, Dornbusch, Park (2001) include these models in the multiple equilibrium framework. See also Morris and Shin (1998) which show that some speculative attacks are due to events not linked to fundamentals.

[6] See also Fratzscher (1999).

partners can suffer from a generalised downwards shift of asset prices, capital outflows or speculative attacks.

This could happen because investors have the expectations that the exports towards the country hit by the crisis will decrease and thus will cause a worsening of the current account. A second channel is represented by competitive devaluations. A devaluation in a first victim country increases its competitiveness in third markets. This could put pressure on the currencies of main trading partners especially if they are under a fixed exchange rate regime.

Gerlach and Smets (1996), Corsetti et al. (2000) show how trade channel after a shock has a twofold effect. If one country devalues its currency, this would have the direct effect of increasing the relative competitiveness of that country's goods. Export to a second country could increase thereby hurting domestic sales within the second country. The initial devaluation could also have the indirect effect of reducing export sales from other countries that compete in the same third markets. Either of these effects could not only have a direct impact on a country's sales and output, but if the loss in competitiveness is severe enough it could increase expectations of an exchange rate devaluation and/or lead to an attack on another country's currency[7].

ii) Asymmetric information and policy co-ordination[8]: This family of models has stressed the role of trade in financial assets in contagion, particularly in presence of information asymmetries and heterogeneous expectation. In the absence of perfect information a crisis in one country could make investors to believe that other nation with similar characteristics could receive a shock. A currency crisis for example could determine a speculative attack in other countries similar to the "first victim" country[9].

This behaviour can be either rational or irrational. If a crisis reveals weak fundamentals, investors may rationally conclude that countries with similar fundamentals could also face similar problems, thus causing contagion. This transmission channel assumes that investors are imperfectly informed about countries' features. They plan their decisions on the basis of some known

[7] See Forbes (2001 a e b) and Forbes (2002)

[8] In this kind of models could be considered also the *Changes in the rules of game* type. Accordino to this kind of model contagion is due to a shift in the operators expectations on the international finance rules. (i.e IMF bail out policy). Calvo (1998, 1999) and Dornbusch (1998, 1999).

[9] For example if a country with a weak banking system is discovered to be susceptible to a currency crisis, investors could revaluate the strength of the banking system in other countries and adjust their expected probabilities of a crisis accordingly.

indicators, including those revealed in other countries, which may or may not reflect the true state of countries' vulnerability.

Calvo (1999) and Calvo and Mendoza (1998) show that in the presence of informational asymmetries, fixed costs involved in gathering and processing country-specific information could lead to herd behaviour, even when investors are rational. The herd behaviour, according to these models could be "*an outcome of optimal portfolio diversification that becomes more prevalent as securities markets grow*"[10].

Chari and Kehoe (1999) and Calvo and Mendoza (2000) analyse the case in which investors apply what they "learn" during a crisis in a country to hedge the risks in countries with fundamentals similar to the ones of the first victim country.

iii) Random aggregate shocks. This approach considers the possibility that global random shocks could hit simultaneously the fundamentals of many countries. For example a rise in the international interest rate, a contraction in the international supply of capital, or a decline in international demand could simultaneously slow growth in a number of countries. Asset prices in any countries affected by aggregate shock would move together, so that directly after the shock, cross-market correlation between countries could increase.

Calvo and Reinhart (1996) and Chunhan et al. (1998) show how changes in US interest rates have been linked to movements in capital flows to Latin America. Corsetti et al. (1998a) and Radelet and Sachs (1998a e 1998b) show how the 1995-6 strengthening of the US dollar versus the yen has been identified as an important factor contributing to weakening exports of East Asian countries and their subsequent financial difficulties. In general, a common shock can lead to increased co-movements in asset prices and/or capital flows.

## I.3 Tests for contagion and main econometric problems

### I.3.1. Test for contagion

The empirical literature testing contagion is even more extensive than the theoretical one. In general, in literature six different approaches have been utilised to measure the transmission of shocks and test for contagion[11]. The first three types of test, here after, try to verify the presence of structural

[10] Calvo and Mendoza (1998).
[11] Pericoli and Sbracia (2001).

breaks in the correlation coefficient, the others try to measure how shocks spread across countries starting from a first victim country[12].

i) *Unexplained correlation o cross-market correlation*: according to this test there is contagion if there is cross-market correlation unexplained by fundamentals. The test of cross-market correlation measures the correlation in returns between two markets during a stable period and then tests for a significant increase in this correlation after a shock.

Calvo and Reinhart (1995) use this approach to test for contagion after the 1994 Mexican peso crisis and find that the correlation in stock prices and Brady bonds between Asian and Latin American emerging markets increased significantly.

Baig and Goldfajn (1998) present the most thorough analysis using this framework and test for contagion in stock indices, currency prices, interest rates, and sovereign spreads in emerging markets during the 1997-8 East Asian crisis. They find that cross-market correlation increased during the crisis for many countries.

Each of these tests based on cross-market correlation coefficients reaches the same general conclusion: correlation usually increases significantly after the relevant crisis and therefore contagion occurs. Some authors[13], underline that a marked increase in correlations among different countries' markets may however not be sufficient proof of contagion. In fact, the apparent increase in the cross market correlations pointed out in the tests during the crisis could be due to some econometric bias.

ii) VAR models and cointegration analysis: These models focus on cross markets changes in long term relationships once a financial shock arises.

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[12] It is worth noticing that even if the most of empirical literature uses macro economics data there are some empirical paper that use microeconomic data: Forbes and Rigobon (2001), Baig and Goldfajn (1998), Claessens, Dornbush and Park (2001), De Gregorio and Valdés (2001), Forbes (2001). These analyses based on macroeconomic data, however, ignore a tremendous wealth of information that is lost in the aggregation used to create the key variables. Within each country there is a large variation in how different companies are affected by financial crises. For example, if a devaluation in one country increases the competitiveness of its exports, firms in other countries should only be directly affected by the devaluation if they sell products which compete with those exports. Companies that produce non-traded goods should be less affected by the devaluation. Empirical studies that simply look at a country's aggregate trade statistics, balance of payments, or total market returns, will ignore these important differential effects across firms.

13 Forbes and Rigobon (2000), Rigobon (2000), Rigobon (2001), Corsetti, Pericoli and Sbracia (2001), Pericoli and Sbracia (2001).

Forbes and Rigobon (1999) estimate a VAR model with daily returns of the stock market and short term interest rates of several industrial and emerging countries, with reference to three financial crisis (the Wall Street crash on October 1987, the Mexican crisis in 1994-95 and the Asian crisis in October 1997). When correlation coefficients are adjusted for the increased volatility, the hypothesis of correlation breakdown is rejected in most of the cases. In fact, they argue that the increase in correlation observable after a shock in one country is simply due to the interdependence among stock markets and not to a change in linkages. Similarly, Rigobon (1999) builds an instrumental variable estimator for testing the correlation breakdown hypothesis relative to 36 stock markets of industrial and emerging countries during the same crisis episodes, showing that, unlike traditional analyses, the hypothesis is almost always rejected[14].

iii) Markov switching models: In the last years, a different kind of empirical analysis has been developed to test discontinuities in the data-generating process, which is based on the Markov switching model developed by Hamilton (1994) and others.[20] This framework has the advantage that discontinuities can be directly attributed to jumps between multiple equilibria.

Jeanne (1997) considers a second generation model of currency crisis in which, for a given range of fundamentals, multiple equilibria arise and determine three different probabilities of a devaluation. In his setting, jumps between multiple equilibria correspond to jumps between the probabilities of a devaluation. Similarly to the classical models illustrated in the theoretical section, once fundamentals enter a multiple equilibria zone, jumps can occur as a result of a sunspot, without any further change in the economy. Moreover, such a sunspot can be represented by a 3X3 Markov transition matrix, which defines the probability that the economy will jump from one given probability of a devaluation to another[15].

Jeanne and Masson (1998) extend both the empirical and the theoretical framework, by including non-linearities and the possibility of chaotic dynamics. In particular, they estimate a model where fundamentals also include a time trend, intended to capture reputation effects that, as suggested by Masson (1995), should grow gradually as a result of Bayesian learning of speculators. In this model, the sunspot is represented as a 2X2 Markov transition matrix. Their estimates, performed over a longer horizon

[14]Forbes and Rigobon (1998) reject the structural break hypothesis for all the countries during the firsts two crises. For the Asian crisis they find an excess of co-movements due to the shock originated in Thailand only for the case of Hong Kong and Italy.

15 Jeanne applies the model to the exchange rate of the French franc with the German mark from January 1991 to July 1993.

(February 1987 - July 1993), yield essentially the same results as Jeanne (1997).

Fratzscher (1999) built a model in which the exchange rate pressure in one country depends on a set of fundamentals of this country, some measures of its real integration (trade linkages) and of financial integration with other countries, and the possibility of regime-switching. He estimates both a 2-regime and a 3-regime Markov switching model on data from 25 emerging countries from 1986 to 1998. Interestingly, he finds that, although Markov switching models without real and financial integration perform well for most countries, any regime-switching is eliminated when integration is included in the analysis. In particular, the model indicates that the transmission of shocks (from both real and financial channels) plays a major role in determining exchange rate pressure both in tranquil times and during crisis periods. Fratzscher (1999) also uses his estimates in order to obtain, for any country, a prediction of the severity of the exchange rate pressure during the Mexican and the Asian crisis and a rank of the vulnerability of countries for both episodes.

iv) ARCH and GARCH models: Empirical studies of the transmission of shocks across financial markets with generalized autoregressive conditional heteroskedastic (GARCH) models have been proposed by Hamao (1990), who analysed the transmission of volatility after the stock market crash of October 1987. The authors find evidence of volatility spillover effects from the US and UK stock markets to the Japanese market. Interestingly, while these effects are statistically significant, spillovers in other directions after 1987 or in any direction before 1987 are much weaker.

Chou et al. (1994), use this procedure and find evidence of significant spillover across markets after the 1987 U.S. stock market crash. They also conclude that contagion does not occur evenly across countries and is fairly stable through time.

Edwards (1998) examines the propagation across bond markets after the Mexican peso crisis by focusing on how capital control affect the transmission of shocks. He estimates an augmented GARCH model and shows that there were significant spillovers from Mexico to Argentina but not from Mexico to Chile. His tests indicate that volatility was transmitted from one country to the other but they do not indicate if this propagation change during the crisis.

v) Probit and logit: This method uses simplifying assumptions and exogeneous events to identify a model and directly measure changes in the propagation mechanism.

A seminal approach to the empirical analysis of contagion is made by Eichengreen, Rose and Wyplosz (1996). The authors construct an index of Exchange Rate Market Pressure (ERP), as a weighted average of changes in the exchange rate, short-term interest rates and international reserves. As a dependent variable, they define a 'crisis dummy' that takes a unit value for extreme values of ERP (and zero otherwise) and estimate a probit model with a set of macroeconomic and political fundamentals among the independent variables.

Their estimates from a panel of 20 industrialized countries from 1959 to 1993 show that the occurrence of a currency crisis in one country increases the probability of a speculative attack in other countries by 8 percentage points. This effect is not only statistically significant, but the crisis dummy results the most significant variable in the model. The authors also try to compare two different causes for transmission: trade linkages and macroeconomic similarities. They build an indicator of trade linkages and one of macroeconomic similarities and find that when they include both indicators in the model only the first one is statistically significant.

This technique has since been widely used. Kumar et al. (1998), who refine the model by adding lagged financial and macroeconomic variables, claim that their model has a high explanatory power. In fact, major crashes (Mexico in 1994, Thailand and Korea in 1997) are correctly forecast. Moreover, they show that trading strategies based on their out-of sample forecasts could have yield positive profits during these two episodes.

Baig e Goldfajn (1998), using a probit model study the impact of daily news in one country's stock market on other countries markets during the 1997-8. They find that a substantial proportion of a country's news impacts neighboring economies.

Kaminsky and Reinhart (1998) estimate the conditional probability that a crisis will occur in a given country and find that this probability increases when more crises are occurring in other countries, especially in the same region.

Caramazza (2000) also estimate a probit model on a large data set of 61 industrial and emerging countries. They focus on the role of external and internal macroeconomic imbalances, financial weaknesses (proxied by the ratio between short-term debt and international reserves), trade and financial linkages. In particular, their model shows that trade linkages (measured by an index constructed to account also for third market competition) and financial linkages (represented by correlation with the stock market of the

crisis country) play a significant role in explaining the transmission of currency crises.

vi) The leading indicators methodology[16]: A somewhat different approach to the analysis of currency crises is proposed by Kaminsky et al. (1998), who evaluate the ability of a set of macroeconomic and financial indicators to forecast the occurrence of a currency crisis correctly. In line with previous models, a crisis is defined as a month in which the variable ERP takes extreme values[17]. For each indicator the authors establish a threshold S, so that the indicator is said to release a signal whenever it is larger than S. To fix the threshold optimally, the authors consider the indicator obtained from the following table:

| | Crisis within 24 months | no Crisis within 24 months |
|---|---|---|
| signal | A(S) | B(S) |
| no signal | C(S) | D(S) |

where A and B are the number of months in which the indicator gives a good and a bad signal, respectively, C is the number of months in which the indicator fails to release a signal, and D is the number of months in which the indicator does not release a signal correctly. For each indicator, an optimal threshold is determined as the solution to the problem min B/A. Kaminsky et al. (1998) identify with this method 12 useful indicators.

This approach has been refined and tested in several papers. Kaminsky (1999) computes a single composite indicator given by a weighted average of the previous indicators.

Berg and Pattillo (1999) show that the original set of indicators developed by Kaminsky et al. (1998) performed poorly in predicting the Asian currency crisis. They estimate the thresholds with data available until April 1995, and find that most of the months of crisis (about 91 per cent) were not signalled, while around 44 per cent of the crisis signals were false alarms.

In a recent paper, Ansuini and Gandolfo (2003) point out that the Kaminsky et al. approach gives some information on the variables that drive the crisis. However, according to the authors, its forecasting ability, at least in its application to the Thai crisis, seems to be far from powerful.

[16] Sbracia and Pericoli (2001).
[17] Eichengreen, Rose and Wyplosz (1996).

**I.3.2. Some econometric issues: Shift contagion or interdependence?**
The test for contagion is one of the empirical puzzles in international economics. Tests for contagion may be biased in the presence of heteroscedasticity, endogeneity and omitted variables.

In the next section we use a simple model (Forbes and Rigobon, 2001) to show how all the three econometric problems above mentioned can bias tests for changes in cross-market transmission mechanisms (i.e. shift contagion).

Assume that there are two countries whose stock market returns are *xt* and *yt* which are described by the following model:

$$yt = \alpha xt + \gamma zt + \eta t$$
$$xt = \beta yt + zt + \varepsilon t$$
$$E[\eta t' \varepsilon t] = 0 \qquad E[zt' \varepsilon t] = 0 \qquad E[zt\,\eta t] = 0 \qquad E[\varepsilon t' \varepsilon t] = \sigma^2_{\varepsilon t}$$
$$E[\eta t' \eta t] = \sigma^2_{\eta t} \quad E[zt' zt] = \sigma^2_{zt}$$

where: $\varepsilon_t$ and $\eta t$ are country-specific shocks that are assumed to be independent but not necessarily identically distributed. Assume also that the return has mean zero. Unobservable aggregate shocks (changes in global demand, exogeneous liquidity shocks, changes in international interest rates) are captured by $zt$. The latter is normalized for simplicity and is assumed to be independent of $\varepsilon t$ and $\eta t$.

Shock are transmitted across countries through real linkages, the stock markets are expected to be endogeneous variables $\alpha,\beta \neq 0$. The variance of the idiosyncratic shocks changes through time to reflect the heteroscedasticity. Test for contagion estimate if the propagation mechanisms ($\alpha,\beta$ and $\gamma$) changes significantly during a crisis.

Forbes and Rigobon (1999) prove that heteroscedasticity in market returns can have a significant impact on estimates of cross-market correlation[18]. For any distribution of error terms, when market volatility increases after a shock, the unadjusted correlation coefficient will be biased upward. In fact this unadjusted correlation coefficient is an increasing function of the market variance.

[18] See Appendix I.

If the variance of *xt* goes to zero then all of the innovations in *yt* are explained by its idiosyncratic shocks ($\varepsilon_t$) and the correlation between *xt* and *yt* is zero. If *xt* experiences a shock and its variances increases, then a greater proportion of the fluctuation in *yt* is explained by *xt*. In the limit, when the variance of *xt* is so large that innovation in $\varepsilon_t$ are negligible, then all the fluctuations in *yt* are explained by *xt* and the cross-market correlation will approach to one.

The critical point is that the propagation ($\alpha$) between *xt* and *yt*, remains constant. Since there is no significant change in how the shocks are transmitted across markets no contagion occurred. However since the correlation coefficient is biased upward after a shock, tests could incorrectly conclude that contagion occurred.

The second problem which is possible to represent by this simple model is endogeneity. The first two equations are endogeneous and it is impossible to identify these equations and estimate the coefficient directly. For example, - in test based on correlation coefficients or GARCH models there is no way to differentiate between shifts in the coefficients or shifts in the variances.

The last problem with this model is omitted variables. When the variance of $z_t$ increases, the cross-market correlation are biased in the same way as when the variance of *xt* increases. When the variance of the aggregate shock is larger, the relative importance of component common to both markets grows, and the correlation between the two markets increases in absolute value. Since unobservable aggregate shocks as well as the stock price in other market would both be omitted variables, this bias is likely to be large and can have a significant impact on tests for contagion

It is very difficult to adjust tests for all the three problems, nevertheless several papers have tried to correct for one or more of these problem and explore how these corrections affect tests for contagion.

Forbes and Rigobon (1999) focus on how heteroscedasticity affects tests for contagion using cross-market correlation coefficients. Lomakin and Paiz (1999) use a similar technique to examine the impact of heteroscedasticity on tests. Each of these papers makes simplifying assumptions so as to avoid the problems of endogeneity and omitted variables. Rigobon (1999) takes a slightly different approach and makes a more restrictive set of identifying assumptions in order to simultaneously correct for heteroscedasticity, endogeneity and omitted variables.

Forbes and Rigobon (1999) use daily data for stock indices of up to 28 developed and emerging markets to test evidence of contagion during three

crisis episodes: i) 1997, East Asian crisis, ii) 1994, Mexican crisis, iii) 1987, US stock market crash.

They show that correlation coefficients for multi-country returns are not significantly higher during crisis periods if the problems of endogeneity, omitted variables and heteroscedasticity are properly corrected for. Forbes and Rigobon conclude that when is defined as a significant increase in the cross-market relationships and correlation coefficients are adjusted for heteroscedasticity, there was virtually no contagion during the East Asian crisis, Mexican peso collapse and US stock market crash.

Lomakin and Paiz (1999) make the same simplifying assumptions as Forbes and Rigobon (1999) to address the problem of heteroscedasticity in test for contagion in bond markets. They use a probit analysis to compute the likelihood that one country will have a crisis given that another country has already experienced one. They find that estimates of this probability will be biased in the presence of heteroscedasticity and that it is impossible to identify the direction of this bias.

Rigobon (1999) makes a different set of simplifying assumption in order to directly identify his model. His assumptions not only solve for endogeneity, but also are valid in the presence of heteroscedasticity and omitted variables. A significant advantage of identifying the model directly is that it is possibile to directly estimate the size of the propagation mechanisms.

Rigobon's key assumption is that during a crisis the variance of the disturbances in only one market increases. Using this assumption, he develops a test where the joint null hypothesis is that only one of the variances of the structural shocks increases and the transmission mechanisms is stable. The test is therefore rejected if either the transmission mechanism changes (i.e. contagion occurs) or if the variances of two or more disturbances increase.

Rigobon (1999) then uses this methodology to test if the cross country propagation of shocks is fairly stable between stock markets during the Mexican, East Asian, and Russian crises. He estimates the same basic model as in Forbes and Rigobon (1999) and tests for a significant change in transmission mechanisms between the stable period before each crisis and the tumultuous period directly after each crisis. In tests for contagion within one month of each crisis, he finds that transmission mechanisms increase significantly in less than 15 percent of the cross-country pairs (and in less than 7 percent during the Mexican crisis.) A sensitivity analysis indicates that model specification can affect results, but in most cases when the results change significantly, there is more than one crisis during the

tumultuous period (which increases the chance of the test being rejected). Rigobon concludes that transmission mechanisms were fairly stable and that shift contagion occurred in less than 10 percent of the stock markets during recent financial crises.

**Concluding remarks and further research**

This chapter is aimed at surveying and analysing the theoretical and empirical literature on international transmission of shocks. It focuses on the recent debate on financial contagion which compares the hypotheses of interdependence and *shift contagion.* Through the analysis of the literature it is possible to point out some interesting issues.

First, what emerges clearly is that in literature there is not yet a uniform definitions of what constitutes contagion. The exact definition (and causes) of contagion are not known neither are the precise policy interventions that can most effectively reduce contagion and moreover according to different definitions, theories, empirical tests results and policy implications change.

In particular, it seems of great interest to distinguish the definitions of *shift contagion* and interdependence. According to the first definition the transmission mechanisms of international shocks change during a crisis, according to the second definition they do not change. Therefore, there is not an excess of co-movement and the transmission channels are the same during crises and during stable period.

Second, the still unresolved dispute concerning shift contagion versus interdependence is reflected in the division of the literature in two blocks: crisis contingent (shift contagion) theories and non crisis contingent (interdependence) theories. Next to the broad theoretical literature the extensive empirical literature could be generated by the attempt to give a solution at the shift contagion versus interdependence puzzle.

Nevertheless the empirical results are heterogeneous. It is worth to notice that the tests for contagion that are not corrected for the main econometric problems (heteroscedasticisty, endogeneity and omitted variables) are biased. As a result tests for contagion that are not adjusted for may suggest that contagion occurred, even when cross- market transmission mechanisms are stable.

Third each of the papers that has attempted to correct for heteroscedasticity, endogeneity and/or omitted variables has shown that the bias from these problems is not insignificant and will affect estimates of contagion during recent financial crises. These papers use a variety of different approaches,

identification assumptions, and model specifications to adjust for one (or more) of these problems. They find that transmission mechanisms were fairly stable during recent financial crises, and since contagion is defined as a significant increase in cross-market linkages after a shock, this suggests that little contagion occurred during recent crises.

According to this findings, further empirical research should focus on why countries are always so vulnerable to movements in other countries. Why do so many markets of such different sizes, structures, and geographic locations generally show such a high degree of co-movement? Does trade with third markets link these diverse countries? What is the role of Free Trade Agreements? Is there an "excess interdependence" across markets in all states of the world? And in this case, what theories could explain the excess of interdependence?

# Chapter II

## *Trade and transmission of currency shocks in Central Eastern European "new" European Union members.*

### 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[19] abandoning the exchange rate as instrument to absorb shocks.

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 chapter is organised as follows. In the first chapter section I.1 surveys 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.2. In the second chapter section II.1 we analyse the relation between trade structure and

[19] In June 2004 Lithuania, Estonia and Slovenia joined the ERM II.

currency shocks transmission. Some preliminary results are presented in the last paragraph.

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

This chapter concentrates on trade linkages as a channel for spreading the effects of economic disturbances and in particular currency crises. The choice is due also to the decision of studying CEECs. In fact, in these countries the financial 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[20].

### II.1.1 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 models[21]. have revived 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

[20] For a complete survey of literature see chapter I.

[21] 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.

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)[22]. 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.

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.

22 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.

### II.1.2 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[23] – the "*crisis dummy*" – in country *i* on the same variable for country *j* weighted by trade data, and on other macroeconomic variables:

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

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.[24]

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.

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[23] 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

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

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 crisis[25] plus a proxy for trade effect:

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

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 $M_{it}$ 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.

[25]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.

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:

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

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 (DT), Total Trade (TT) and Trade Share (TS), which they define respectively as follows:

$$\text{DT}_i = 1 - \left| x_{i0} - x_{0i} \right| / (x_{i0} + x_{0i})$$

$$\text{TT}_i = \left[ 1 - \left| x_{i0} - x_{0i} \right| / (x_{i0} + x_{0i}) \right] * T_i + DT_i * \left[ (x_{i0} + x_{0i}) / (x_0 + x_i) \right]$$

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

*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 phenomena[26].

**(ii) "Contagion" and trade structure.** Diwan and Hoeckman (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.

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:

$$XIi = (Xij/Xi)/[Mj/(Mw-Mi)]$$

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 trade[27]:

$$XSij = \sum_{a} [\min (xai , xaj )] * 100$$

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.

[26] 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.

[27] This measure was first proposed by Finger and Kreinin (1979).

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 trade[28].

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

28 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."

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 2000).*

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.

## II.2 Trade features and vulnerability to currency shocks in a Centre-Periphery framework

One of the aims of this chapter 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.

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)[29]. 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 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[30].

(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 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 improvement.

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[29] See the appendix.

30 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. $\rho \leq \psi$.

**Table II.1a Vulnerability to currency shocks**

Corsetti et al. show that in the case of devaluations:
If: Intra- Periphery trade =0
then:

| | $\psi>0$ |
|---|---|
| Full pass-through (sellers currency) | Beggar-thy-neighbour |
| No pass-through (buyers currency) | Low vulnerability to currency crisis |

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

then:

| | $\psi>0$ |
|---|---|
| Full pass-through (sellers currency) | Ambiguous (Price effect and terms of trade effect) |
| No pass-through (buyers currency) | Beggar-thy-neighbour |

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

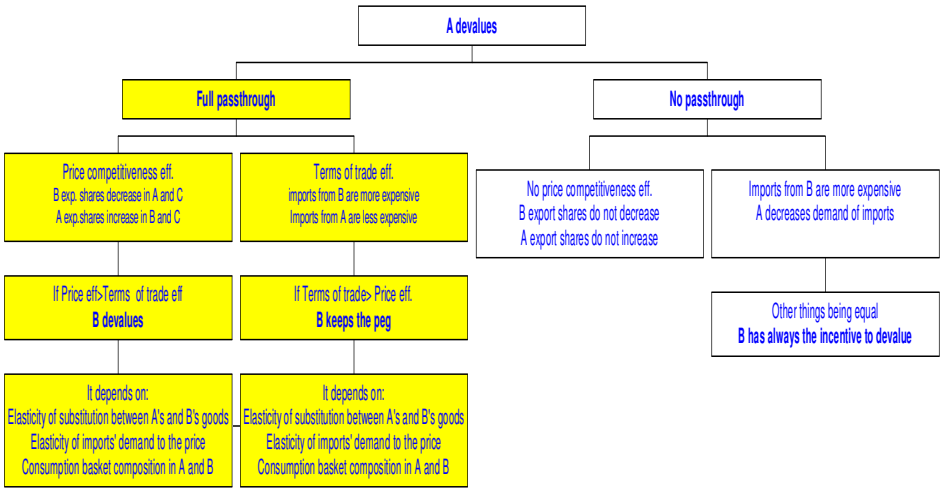
In case of no pass through Corsetti et al. show that there are no relative price competitiveness effects and export shares of the devaluating country remain the same. Country A's devaluation is beggar thy-neighbour as it reduces exports, revenues and profits of producers in B. The conclusion are more 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" (Corsetti et al. 1998b)* (tab II.1b).

(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.

**Table II.1b Transmission of currency shocks**




## II.3. Indicators of vulnerability linked to trade structure

### II.3.1 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[31]. 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[32] soon, from today's perspective, may not suffer from substantial objections.

[31] 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.

[32] 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 +-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.

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.

**Table II.2a: 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 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. |
| Fixed peg | | | | |
| Latvia | Peg to the SDR basket of currencies | Latvian lats – LVL | Exchange rate bands ±1% of the central rate | No, but planning to join ERM II and to peg to euro on 1 January 2005. |
| **Pegged ex 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 ± 15% fluctuation band. Parity changed to 284.1 from 276.1 as of 4th 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 | 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. |
| **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.

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.

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.

In the case of Estonia, Latvia, Lithuania and Slovenia the decision to join the ERM II immediately after the accession 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.

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.

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 2.b) and eventually the EMU, abandoning flexible exchange rate as effective instrument for absorbing shocks.

**Table II.2.b Timing of ERM II and Euro adoption**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|
| Czech Republic | | | ERM II | | | EMU |
| Estonia* | ERM II | | | EMU | | |
| Hungary | | ERM II | | | EMU | |
| Lithuania* | ERM II | | | EMU | | |
| Latvia | | ERM II | | | EMU | |
| Poland | | | ERM II | | | EMU |
| Slovenia* | ERM II | | | EMU | | |
| Slovak Republic | | ERM II | | | EMU | |

*27 June 2004
Source: *Deutsche Bank Research, ECB*

(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.3.2 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 (further strengthened by the European Association Agreement

signed bilaterally by those countries[33]) led to an increase of their market shares in EU trade[34].

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 (tab. 3). 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.

**Table II.3 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 |
| 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: Our calculation on 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

[33] This issue will be further analyzed in the third chapter.
[34] Zaghini (2003)

having a minor role as export markets. Among the eight countries (tab.4) 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, 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 II.4 Bilateral export shares by destination**

(Total exports %, 2002)

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

Source: Our calculation on 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 two digit 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 II.5 Glick and Rose trade linkages*** (2002)

| Countries pairs | Competition in third markets (EU) (TradeShare[35] SITC Rev.3) | | Direct linkages (Direct trade[36], 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 COMTRADE UN, SITC Rev 3 two digit.

Table 5 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.

35Trade Share$_i$ = $\Sigma k\{[(x_{0k}+x_{ik})/(x_0+x_i)]*[1-|(x_{0k}/x_0)-(x_{ik}/x_i)|((x_{0k}/x_0)+(x_{ik}/x_i))]\}$ where: $x_{ik}$ = export from i to k ($k \neq i$, 0), 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.

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

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.

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.3.3 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.

**Table II.6 Indexes of export similarity: the Finger and Kreinin index[37]**
(On manufactures in % of manufactures export, 2002, export market EU, SITC)

| | Estonia | Hungary | Latvia | Lithuania | Poland | S Rep | Slovenia |
|---|---|---|---|---|---|---|---|
| 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 |
| Sv.Rep. | | | | | | | 93.4 |

Source: Our calculation on Eurostat New Cronos, SITC Rev 3 two digit.

One simple measure of the substitutability of each country's exports is the Finger and Kreinin index[38].

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37 •$ES_{ij} = \Sigma a [\min (x_{ai}, x_{aj})] * 100$, $x_{ai}$ 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

38 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.

Table 6 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.3.4 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".

**Table II.7 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 coef | 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 coef | 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, therefore we introduce assumption that the pass-through is = 1 derived by Coricelli et al. (2003) and Zsolt (2001)
Source: Our calculation on Datastream data.

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.

Let $e$ be the nominal exchange rate, $P^F$ the foreign firm's price level expressed in foreign 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.

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 7).

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[39]. 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[40].

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.

In the case of Estonia, Latvia and Slovak Republic, that seem to have a low pass-trough, 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 worse the economic

[39] This firm policy in case of appreciation of the national currency against the euro implies a "skimming" pricing strategy while in case of depreciation a "penetration" or "market share" pricing strategy. See Sundaram and Mishra (1992).

[40] 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.

conditioned of trading partners in the periphery giving to them an incentive to match the devaluation.

**Concluding remarks**

In table 8 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 8). 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.

**Table II.8 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.

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.

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).

# Chapter III

## *Regional arrangements and the pattern of trade flows in the enlarged European Union. A gravity model estimate for the Central Eastern European Countries.*

### Introduction

The object of this chapter is to estimate the effect of European Union eastwards enlargement process on trade patterns in the Union. In particular, we intend to investigate whether and how the Free Trade agreements signed by CEECs[41] have exerted a different impact on centre-periphery and intra-periphery trade relationships. We also intend to evaluate if the perspective to join the EU has had anticipated, additional positive effects on exports flows coming from the eight CEE countries which joined the EU in May 2004.

Although the formal beginning of negotiations for eastward EU enlargement is more recent, the CEEC accession process somehow began in the early 90s, therefore shortly after the free market system got under way. In fact, since then the acceding countries have been signing bilateral agreements with EU (i.e. the European Association Agreements) which have represented an advance in the path towards integration through stipulating a progressive liberalisation of trade.

[41] Note that both here and in the rest of the paper, the acronym CEECs is used to refer to the eight Central and Eastern European countries which joined the EU in May 2004: Hungary, Poland, Czech and Slovak Republic, Slovenia, Lithuania, Latvia and Estonia

It is worth noticing that starting from 1992, Czech and Slovak Republic, Hungary and Poland have created the Central European Free Trade Agreement (CEFTA) and in 1996 Slovenia joined CEFTA as a full member. In 1994 also the Baltic Free Trade Agreement (BAFTA) entered into force. Furthermore, CEECs signed several bilateral trade agreements among themselves.

We also intend to investigate if the progressive accession and integration of the CEECs with the EU and among themselves have involved non only increased trading with the former EU member countries but also a geographical restructuring of the trade flows across the European Union members (centre and periphery).

The literature on trading bloc effects typically focuses on the Vinerian trade creation and trade diversion effects while the impact of economic integration and the creation of trading blocs on intra-bloc typically received minor attention.

This paper analyses bilateral trade flows between eight CEECs and EU-23 (EU-15 + CEECs, partner countries). We estimate a gravity equation using a system GMM dynamic panel data approach.

The chapter is organised as follows. The first section surveys theory and empirics. The path towards integration through stipulating a progressive liberalisation of trade for CEECs is briefly analysed in section II. Section III describes the estimated equation, the empirical strategy and the data. Results are presented in section IV, conclusions follow.

## III.1 A review of the literature on regional integration in Eastern Europe

In the last ten years, gravity models have also been broadly used in empirical studies of integration processes, in order to explore main changes in geographical trade pattern and to analyse the effects of regional and free trade agreements (RTA, FTA) and currency unions (CU) on trade flows.

After the 1991, special attention in the gravity models literature has been given to estimate potential trade flows between EFTA, EU, CEECs and Baltic countries (Baldwin 1997; Gros and Gonciarz 1996, Brenton and Di Mauro 1999; Nilsson 2000, Lasser and Schrader 2002, Brenton and Manzocchi 2002).

The most of the above mentioned papers find out that RTAs (European Agreements), that have been put in place to prepare transition countries for

accession to EU, have prompted substantial growth in EU-CEEC trade flows (i.e. regional dummies have positive and significant coefficients). Therefore most adjustment on trade flows has already occurred and the expected further effects of the completion of EU enlargement will be modest.

In the empirical literature on EU Eastern enlargement, however, the study of geographical restructuring of the trade flows, due to the entry into force of RTAs and FTAs, among the former and the new members received a minor attention.

Paas (2003) find that behaviour of bilateral trade flows within the countries involved in EU eastward enlargement accords to the normal rules of gravitation. He also finds that there are statistically significant spatial biases caused by the trade relationship between the Baltic Sea Region countries, the border countries and the EU member candidates countries. The East West trade relationships are still rather weakly developed and there is a statistically significant difference in international trade patterns between the two groups: Bilateral trade relations between the EU member and the CEECs are still less developed than trade relations between the former EU member.

Martin and Turrion (2001) analyse the determinants of trade patterns between the CEECs and the OECD countries since the former began the processes of transition and opening up within the framework of the Association Agreements with the EU (EAs). To anticipate the trade impacts of their accession to the EU they estimate a gravity model for a set of countries formed by the EU members, the CEECs and the other members of the OECD (by way of a control area).The results confirm that the EAs have led to a preferential expansion of exchanges between the EU and CEECs. In fact, as regards regional dummies, they find that the increase in the export shares of CEECs in EU is sharper that the increase in those of third countries (the coefficient of dummies are 2.38 and 1.35 respectively).

Laaser and Schrader (2002)'s gravity model estimates suggest in the specific case of Estonia, Latvia and Lithuania that regional integration is much more intense than it is normally observed. According to the authors the role of distance (transport cost saving) for the Baltic countries is much more important in shaping their regional trade pattern than the institutional integration into the EU via the EAs. Laaser and Schrader estimates show that the process of EU association was not determinant, despite the expectation that the trade agreements with EU would have fostered Baltic-EU trade flows while regional determinants dominated. Hence they conclude that the process of European integration mainly runs via Baltic

countries neighbours and that the transport system dominates the trade regime by shaping trade flows in this region (the coefficient of distance is close to one in all the estimates).

Damijan and Masten (2002) explores the time-dependent efficiency of free trade agreements (FTAs) in a panel framework using static and dynamic model specifications. It shows that trade liberalisation per se need time to become efficient. Using an illustrative case of rapid expansion of Slovenian imports from other CEECs being part of CEFTA in the period 1993-98 the paper demonstrates that tariff reductions become effective in the second to third year after enforcement of the FTA. Regarding the effect of CEFTA agreement the analysis revealed that to be part of CEFTA increased the exports of other CEECs towards Slovenia by 18.5%.

### III.2 EU enlargement and CEECs: The "pure trade" effects and the "EU membership factor" effects.

At the end of the EU enlargement process, the new members will enter into the highest stage of economic integration in the EU: They will join Economic and Monetary Union, as "no opt out" clause is allowed for new entrants. In May 2004, the new members entered the EU on the level of the Single Market. A participation also in EMU since the beginning has been considered not possible giving that most of the acceding countries did not yet fulfil the convergence criteria provided by the Maastricht Treaty[42].

In the case of EU enlargement we have to deal with the standard effects of regional integration[43], "pure trade" effects, plus a specific aspect: "EU membership factor" effects.

"Pure trade" effects are the traditional trade effects of economic integration that occur through trade creation and trade diversion. Trade creation refers to increased trade generating new economic activity, whereas trade diversion refers to redirection of existing trade as result of changes in tariffs and other barriers due to regional custom union. "EU membership" effects are the positive effects exerted on trade and economic activity by the participation in European Single Market.

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42 The ECOFIN Council of November 7, 2000 in its statement on the implications of the accession process upon exchange rate arrangements in the acceding countries identified three distinct stages for the full monetary integration of candidate countries (i) the pre-accession stage (free choice of an exchange rate regime; (ii) the accession stage (new member states shall treat their exchange rate policy as "a matter of common interest" (EC treaty Art. 124); (iii) after accession the new member countries are expected to join the ERM II.

43 Baldwin and Venables (1995).

### III.2.1 The "pure trade" effects: the RTAs and the FTAs

With respect to the "pure trade" effects it has to be noted that EU has concluded European Agreements (EAs) with CEECs during the 1990s. That implies that an asymmetric tariff reduction has taken place in trade between the EU and the CEECs. Since 1997, the EU has eliminated practically all tariffs (exceptions are agricultural and sensitive products) on imports from the CEECs. Having joined the EU in 2004, the CEECs entered into the customs union of the EU (Common External Tariff and Common Commercial Policy) and participated in the Single Market of the EU and border controls has been abolished.

Tab.III.1 Free Trade Agreements

| | Date of entry into force | | | | | | |
|---|---|---|---|---|---|---|---|
| | CMEA | EU GSP | CEFTA | BAFTA | OECD | WTO | EA |
| C R. | 1-1-49 | 1991 | 1-3-93 | | 21-12-95 | 1-1-95 | 1-3-92 |
| E | 1-1-49 | 1992 | | 1-4-94 | | 13-11-99 | 1-1-95 |
| H | 1-1-49 | 1990 | 1-3-93 | | 7-5-96 | 1-7-95 | 1-3-92 |
| LV | 1-1-49 | 1992 | | 1-4-94 | | 10-2-99 | 1-1-95 |
| L | 1-1-49 | 1992 | | 1-4-94 | | 31-5-01 | 1-1-95 |
| P | 1-1-49 | 1990 | 1-3-93 | | 22-11-96 | 1-7-95 | 1-3-92 |
| SR. | 1-1-49 | 1991 | 1-3-93 | | 14-12-00 | 1-1-95 | 1-3-92 |
| S | | 1980* | 1-3-96 | | | 30-7-95 | 1-1-97 |

CMEA: Council for Mutual Economic Assistance, CEFTA: Central European Free Trade Area, BAFTA: Baltic Free Trade Agreement, EA: European Agreement. GSP: Generalised System of Preferences

*Slovenia retained preferential status for its exports under the so-called autonomous trade preferences granted by the EU to Yugoslavia in the 1980 Cooperation Agreement

Source: http://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm1_e.htm

Although trade components of EAs with some CEECs went into effect on different dates ranging from 1992 (former Czechoslovakia, Hungary and Poland) to 1996 (Slovenia), schedules of elimination of duties and non tariffs barriers on industrial products had one important component in common. They all had January 1, 2002 as the date to complete the process of liberalization.

EAs are bilateral agreements between EU and individual applicant countries (table 1). It should be emphasized that these agreements do not exist between applicant countries. The EAs thus could have led to the emergence of the so called "hub-and-spoke" pattern, creating trade between the EU and each applicant country separately, while discouraging trade among applicant countries.

Several CEECS have also signed free trade agreements among themselves (tables 1 and 2). The first preferential agreement among CEECs was CEFTA44, which entered into force in 1993. Its membership gradually expanded over time. Baltic states signed FTA among themselves in 1995 (BAFTA).

Tab.III.2 Intra-Periphery Free Trade bilateral Agreement

| | Date of entry into force | | | | | |
|---|---|---|---|---|---|---|
| | E | H | LV- | L | P | S R |
| Czech Rep. | 12-Feb-98 | | 1-Jul-97 | 1-Jul-97 | | 1-Jan-93 |
| Estonia | | 1-Mar-01 | | | | |
| Hungary | | | 1-Jan-00 | 1-Mar-00 | | |
| Latvia | | | | | | |
| Lithuania | | | | | | |
| Poland | | | 1-Jun-99 | 1-Jan-97 | | |
| Slovak Rep. | 12-Feb-98 | | 1-Jul-97 | 1-Jul-97 | | |
| Slovenia | 1-Jul-97 | | 1-Aug-96 | 1-Mar-97 | | |

Source: http://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm1_e.htm

### III.2.2 CEECs trade opening: Some stylised facts

To examine some features of the process of trade opening up of CEECs, table 3 and 4 follow. They contain information on bilateral trade flows coming from CEECs directed towards the Centre (EU15) and the Periphery (CEECs).

In short, the features found in the trading pattern of CEECs suggest that export share towards EU-15 was, in the first half of the 1990s, relatively high partly because reduction in trade barriers have already taken place.

After the 1989, in fact, the EU granted GSP (Generalised System of Preference) status first to Hungary and Poland (1990), then to Bulgaria and former Czechoslovakia (1991), and subsequently to Estonia, Latvia and Lithuania (1992). Slovenia retained preferential status for its exports under the so-called autonomous trade preferences granted by the EU to Yugoslavia in the 1980 Cooperation Agreement (table 1). The GSP status

44 The CEFTA provides a framework for bilateral agreements among seven states. More precisely, the CEFTA system has two components: multilateral and bilateral. A multilateral component comprises commonly agreed preferences, whereas a bilateral one those negotiated bilaterally and not extended to all CEFTA members.

significantly improved access of exporters from CEECs to EU markets, especially, for industrial products[45].

Following the demise of central planning and the associated collapse of the CMEA, trade linkages among CEECs contracted dramatically and still remain very weak. The share of this trade increased between 1989 and 1993 but mainly because of the dissolution of Czechoslovakia.

Tab. III.3 Share of export to Former CPE** and EU

| | CPE** | | EU | |
|---|---|---|---|---|
| | 1988 | 1992 | 1988 | 1992 |
| Czechoslovakia* | 47.7 | 19.7 | 38.4 | 61.8 |
| Hungary | 43.6 | 7.7 | 39.1 | 75.1 |
| Poland | 35.7 | 15.7 | 49.2 | 62.3 |
| Estonia | n.a. | 29.2 | n.a. | 68.5 |
| Latvia | n.a. | 58 | n.a. | 38.5 |
| Lithuania | n.a. | 57.8 | n.a. | 39.1 |

*Excludes intra Czech-Slovak trade,
** CPE is defined as Federal Soviet Union (including Baltics), Bulgaria, Czechoslovakia, Hungary, Poland and Romania
Source: Hoekman B., Djankov S. (1996)

The bulk of intra-CEECs trade takes place between the Czech Republic and Slovakia, which until 1992 had been part of the same national economy. Combined exports from Czech Republic and Slovakia to CEECs (table 4b) account for around two thirds of intra-CEECs exports[46].

The geographical redistribution of trade flows in the period 1993-2003, into the EU-23 seems to have been generally in favour of the Centre (EU-15). The only relative exceptions are Hungary, Poland and Slovenia (tab.4b). With respect to the world total, data show an increase in intra-periphery trade flows for all CEECs with the exception of Czech and Slovak Republic (tab.4a).

It is a very difficult task to identify with any precision the extent to which preferential access to EU markets was responsible for reorientation in geographic patterns of trade of CEEC. Under central planning regime they undertraded with the EU and overtraded with each other and other members

45 GSP preferential rates embraced 63 percent of all CN tariff lines in EU imports with most of them (94 percent of GSP items) subject to zero rates. The interim trade component of EA overshadowed GSP arrangements by retaining preferential tariffs and making them permanent rather than subject to annual reviews (Kaminsky 2001).
46 Kaminsky 2001.

of the former CMEA[47]. A sizable portion of the adjustment can be attributable to the correction in earlier trends.

Tab.III.4 Trade integration vs EU (% of World total)

| Table 4a | 1993 | | | 2003 | | |
|---|---|---|---|---|---|---|
| | EU/W | C/W | P/W | EU/W | C/W | P/W |
| Czech Rep. | 73 | 48 | 25 | 63 | 51 | 12 |
| Estonia* | 39 | 30 | 09 | 81 | 67 | 14 |
| Hungary | 35 | 34 | 1 | 66 | 60 | 6 |
| Latvia | 43 | 33 | 10 | 83 | 67 | 16 |
| Lithuania | 47 | 36 | 11 | 53 | 39 | 14 |
| Poland | 71 | 67 | 4 | 77 | 66 | 11 |
| Slovak Rep. | 79 | 28 | 51 | 65 | 46 | 19 |
| Slovenia | 55 | 54 | 1 | 63 | 56 | 7 |
| | Trade integration vs EU(% of EU15+ CEECs) | | | | | |
| Table 4b | 1993 | | | 2003 | | |
| | C/EU | P/EU | | C/EU | P/EU | |
| Czech Rep. | 66 | 34 | | 81 | 19 | |
| Estonia* | 64 | 36 | | 83 | 17 | |
| Hungary | 97 | 3 | | 92 | 8 | |
| Latvia | 76 | 24 | | 81 | 19 | |
| Lithuania | 62 | 38 | | 73 | 27 | |
| Poland | 94 | 6 | | 86 | 14 | |
| Slovak Rep. | 36 | 64 | | 71 | 29 | |
| Slovenia | 99 | 1 | | 89 | 11 | |

*1994, EU= EU-15 + CEECs, C= Eu-15, P= CEECs
Source: IMF DOTS

While the shift from a supply-constrained economic regime to a demand-constrained regime, combined with the collapse of import demand in CMEA, could have been the major force behind the expansion of CEECs-EU trade. We assume that also the measures introduced by the EU to support transition and accelerate re-integration of CEECs into EU markets have also contributed to trade expansion.

47 Council for Mutual Economic Assistance, (COMECON or MEA), international organization active between 1956 and 1991 for the coordination of economic policy among certain nations then under Communist domination, including Albania (after 1961), Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the Soviet Union. Yugoslavia participated in matters of mutual interest. Although it was formed in 1949, a formal charter was not ratified until 1959. The charter gave COMECON the same international status as the European Economic Community (Common Market), but the structure was controlled by heads of state.

### III.2.3 The "EU membership factor"

Concerning the "EU membership factor" effects, we refer to the boost that trade receives through movements of factors of production and other dynamic effects such as capital accumulation, technology transfer, increased competition and exploitation of economies of scale.

The EU membership, which also implies for these countries a commitment to a peg exchange rate (ERM II) and eventually to a single currency will likely change the international assessment of risk in these countries. The exchange rate stabilisation, the EU "seal of approval" and the macroeconomic stabilisation programmes that accompany accession are the source of standard returns from Centre-Periphery type integration to the Periphery. These usually included increased flows of trade as well as of direct and portfolio investment as investor face lower institutional and policy risks.

Although it is too early to account for the post accession effects of the EU membership factor, it seems in some way reasonable to measure the "anticipated" effect of the "EU factor" on bilateral trade.

In fact, although the formal accession was in May 2004 the process began in the early 1990s. At the European Council summit in Copenhagen (June 1993), the EU invited the CEECs to enter the EU and formulated the three accession criteria (democracy, market economy and *acquis communautaire*). In late 1997, Hungary, Poland, Czech Republic, Slovenia and Estonia started negotiation (the "Luxembourg group"); whereas the other CEECs started in 1999 (the "Helsinki group"). Eventually, at the European Council of Laeken (December 2001) the Council agreed with the European Commission Report that all candidates, with the exception of Romania, Bulgaria and Turkey, were suitable to join the European Union.

We intend to test which role, if there is any, had the pure trade and EU membership effects on bilateral flows between CEECs and former EU countries.

## III.3 Equation, empirical strategy and data description

We introduce three sets of variables: i) gravity variables, ii) controls for heterogeneity iii) controls for dynamics. Dummy variables to test the effects of FTAs on bilateral trade flows between CEECs and EU 22 (the importer countries) are also introduced in the estimates.

i) Standard gravity variables. Bilateral distance as a proxy of transport costs and importer and exporter's GDP as proxies respectively of demand and

production factors. We add to this standard specification an index of relative country size, an index of absolute difference in relative factor endowments48 between trading partners and an exchange rate volatility index.

ii) Controls for heterogeneity. Following Baltagi Egger and Pfaffermayr, (2003) we introduce fixed effects for importer and exporter countries. Differently from these authors, we don't control also for country-pair effects (i.e. the interaction effect between exporter and importer country picking up unobserved characteristics of country-pair) because this kind of variables would include the impact of bilateral trade agreements that we want to control by specific dummies.

Again, differently from Baltagi et al. (2003), we do not introduce interaction terms between exporter and importer countries and time(it and jt)49. Following Bun and Klaassen (2004), we introduce instead a set of country-pair specific time trend the reason being that trade flows tend to grow over time.

Although using panel data allows for time effect to correct for any residual trend common to all bilateral trade flows, trends may vary across country-pairs. For instance, transportation costs depend on country-pair distance and the structure of trade; these elements varies between country-pairs. Transportation costs have decreased over time and this could have been increased bilateral trade flows; it is unlikely that standard (common) trend correction could completely avoid omitted trend variables bias.

As Bun and Klaassen (2004) underline, this approach is more flexible in the cross-sectional dimension (ij) with respect to Baltagi, Egger and Pfaffermayr formulation: It allows the trade development over time to be driven by other than national factors (i.e. transportation costs). We impose linearity for trends (at the cost of restricting it and jt dimension) instead of allowing for unrestricted time variation (at the cost of restricting the ij dimension). Linear trends usually capture the most part of trending variables. The estimates are robust also when we generalized the linearity hypothesis by allowing for quadratic trends.

Controlling for exporter, importer and bilateral time trend effect is possible to proxy the multilateral "trade resistance index" (see Anderson and van

[48] See Helpman and Krugman (1985)

[49] This approach, allowing for each country to have a separate parameter for each time period when it is an exporter and another one when it is an importer, leads to a maximum flexibility in it and jt dimension of the panel: all possible nation-specific variables can move unrestrictedly over time.

Wincoop (2003)), obtaining a specification of gravity equation that can be interpreted as a reduced form of a model of trade with micro foundations[50].

iii) Controls for dynamics. It is worth to underline that when considering the time dimension, one should not forget that accession is a very recent phenomenon.

Given the novelty of the phenomenon, traditional static gravity models, that generally deal with long-run relationships, are not well suited to interpreting the repercussions of the accession. For this purpose, we need to make the gravity equation more short-run oriented, by explicitly introducing dynamics, controlling for the lagged effects of the dependent variable and detecting the short term influences of the "forthcoming accession" and of all other variables affecting bilateral trade in EU enlarged.

Indeed, the "short run" can generally be highly relevant in trade analyses, since countries that trade a lot with each other tend to keep on doing so. Such inertia mainly derives from the sunk costs exporters have to bear to set up distribution and service networks in the partner country, leading to the emergence of substantial entrance and exit barriers (see Eichengreen and Irwin, 1996). This sticky behaviour seems all the more important in the case of CEECs –EU 15, where trade relationships are affected not only by past investment in export-oriented infrastructures, but also by the accumulation of invisible assets such as political, cultural and geographical factors characterising the area and influencing the commercial transactions taking place within it.

It is worth noticing that, notwithstanding the general importance of the "persistence effects", quite a few studies, based on a panel estimation of gravity equations, have considered the possibility of controlling for them (Egger 2000, De Grauwe and Skudelny 2000, Bun and Klaassen 2002, De Nardis and Vicarelli 2003).

The introduction of dynamics into a panel data model raises an econometric problem. If trade is a static process, the "within" estimator (fixed-effect estimator) is consistent for a finite time dimension T and a infinite number of country-pairs N. But if trade is a dynamic process, the estimate of a dynamic panel like our model (a static one with the lagged dependent

[50] Anderson and van Wincoop (2003) pointed out that trade between a pair of countries depends on their bilateral trade barriers with all trading partners: trade will be stronger for those countries with a relatively low trade barriers. Rose and van Wincoop (2001) approximate the multilateral trade resistance index using country-pair fixed effects. Ritschl and Wolf (2003) and Estevadeordal et al. (2003) propose using country-group dummies; our approach follow this suggestion.

variable) is more difficult. The reason is that the transformation needed to eliminate the country-pair fixed effects produces a correlation between the lagged dependent variable and the transformed error term that (for a finite T and an infinite N) renders the least square estimator biased and inconsistent.

There are alternative estimators with which to bypass this inconsistency problem. Arellano and Bond (1991), suggested to transform the model into first differences and run using the Hansen two-step GMM estimator. First differencing the equation removes the random effects that are independent and identically distributed among individuals, and produces an equation estimable by instrumental variables.

As far as the gravity model, the proposed strategy is however not costless. On the one hand, first-differencing the equation removes fixed effects but also time invariant regressors that are in the specification. If those regressors are of interest, the loss of information implied can be of no second order. On the other hand, first-differenced GMM estimator performs poorly in terms of precision if it is applied to short panels (along the T dimension) including highly persistent time series (Blundell and Bond, 1998). Lagged levels of time series that have near unit root properties are in fact weak instruments for subsequent first-differences. Since bilateral exports between (old and new) industrialized countries are expected to change sluggishly, one might suspect that this would affect our estimates.

Arellano and Bover (1995) describe how, if the original equations in levels were added to the system of first-differenced equations, additional moment conditions could be brought to bear to increase efficiency. They show how the two key properties of the first differencing transformation - eliminating the time-invariant individual effects while not introducing disturbances for periods earlier than period t-1 into the transformed error term – can be obtained using any alternative transformation (i.e. forward orthogonal deviations).

Blundell and Bond (1998) articulated the necessary assumptions for this "system GMM" estimator more precisely and tested it with Monte Carlo simulations[51].

As far as we know, very few studies adopted this methodology in the context of a gravity approach[52].

The estimated equation is:

51 Bond (2002) is good introduction to these estimators and their use.
[52] See for example De Benedictis and Vicarelli (2005).

$$\text{Ln}\ (Exp_{ijt}) = b1\ln(Exp_{ijt-n}) + b2\ln(GDP_{it}) + b3\ln(GDP_{jt}) + b4(SIMIL_{ijt}) + b5(ENDOW_{ijt}) + b6\ln(Dist_{ij}) + b7VOL_{ijt} + b8\ FTAP_{ijt} + b9\ FTAEU_{ijt} + b10\ Entr_{ijt} + b11\ Lux_{ijt} + b12\ Helsinki_{ijt} + b13\ \alpha_i + b14\ \beta_j + b15(\tau_{ij}t)$$

where:

*ln* = the natural logarithm, i is the exporter country, j is the importer country and t is the year, n is a lag structure for the dependent variable;
$Exp_{ijt}$ = the exports in value from country i to country j;
$GDP_{it}$ = the gross domestic product of the exporter country.
$GDP_{jt}$ = the gross domestic product of the importer country;
$SIMIL_{ijt}$ = similarity index of two's trading partners GDP as measure of relative country size; it is build as:

$$\ln\left[1-\left(\frac{GDPit}{GDPit+GDPjt}\right)^2-\left(\frac{GDPjt}{GDPit+GDPjt}\right)^2\right]$$

$ENDOW_{ijt}$ = the absolute difference in relative factor endowments between country-pairs; it is build as:

$$\left|\ln\left(\frac{GDPit}{POPit}\right)-\ln\left(\frac{GDPit}{POPit}\right)\right|$$

where *POP* is the population.

$VOL_{ijt}$=is the exchange rate volatility between counties i and j at time t; it has been measured by the standard deviation of the first difference of monthly natural logarithm of the bilateral nominal exchange rate at the current year y.
$Dist_{ij}$= is the distance between country pairs.

$FTAP_{ijt}$ =is a dummy variable that assumes value 0 for the absence of free trade agreements or customs unions among Periphery countries, 1 (year of entry into force) if these agreements are present;
$FTAEU_{ijt}$ =is a dummy variable that assumes value 0 for the absence of free trade agreements or customs unions among Periphery and EU –15 countries, 1 (year of entry into force) if these agreements are present;

$Entr_{ijt}$ = is a dummy variable embodying the "announcement effect" of the entrance of the eight new member countries in EU. This announcement is dated at the European Council of Laeken in December 2001. The dummy assumes value 1 since 2002 for all country pairs in the sample.

$Lux_{ijt}$ = is a dummy variable embodying the "announcement of negotiations effect" for Hungary, Poland, Czech Republic, Slovenia and Estonia. The dummy assumes value 1 for exports coming from each of these countries 0 otherwise.
$Helsinki_{ijt}$ = is a dummy variable embodying the "announcement of negotiations effect" for Latvia, Lithuania and Slovak Republic. The dummy assumes value 1 for export coming from each of these countries, 0 otherwise.
$\alpha_i$ = exporter country dummy; it is a dummy that assumes value 1 if export flows come from exporter country i to each one of importer countries j, 0 otherwise;
$\beta_j$ = importer country dummy; it is a dummy that assumes value 1 if export flows come from each one of exporter countries i to importer country j, 0 otherwise;
$\tau_{ij}$ t = bilateral trend variables.

The sources of these variables are shown in table 5.

Tabl. III.5 Source and definitions of variables

| variables | source | sample period |
|---|---|---|
| Bilateral export flows (current price, US $ millions) | Direction of trade statistics, International Monetary Fund | 1990-2003 |
| Free Trade Agreement | European Commission and World Trade Organisation | 1990-2003 |
| GDP (current price millions US $) | World Economic Outlook database, International Monetary Fund | 1990-2003 |
| Distance | Paul Brenton and Francesca Di Mauro http://www.ceps.be | 1990-2003 |
| Population | Queen database, Eurostat | 1992-2003 |
| GDP per capita | Queen database, Eurostat | 1992-2003 |
| Exchange rate | IFS FMI, and BCE | 1992-2003 |

We expect that bilateral export flows are positively influenced by:

i) the lagged endogenous variable. We expect that countries trading a great deal each other would continue to do so, thus reflecting entrance and exit barriers due to sunk costs.
ii) the real GDP of importer and exporter countries. In gravity models trade flows are positively influenced by the dimension of origin and destination countries proxied by GDP.

iii) The presence of bilateral and multilateral free trade agreements. These dummies proxied the pure trade effects and are expected to have a positive impact on trade flows.
iv) The announcements of entry into the EU. These dummies proxied the "EU membership factor effects" and are expected to have a positive effect on trade flows.

We also expect that bilateral export flows are negatively influenced by:

i) distance. It is used as proxy for the transport costs and cultural proximity between two countries;
ii) exchange rate volatility

We have no a priori on the signs of:

i) relative country size index and ii) differences of factor endowments index. A positive (negative) sign of the first index and a negative (positive) sign of the latter could support the hypothesis that bilateral flows are higher (lower) the more similar two countries are (in terms of size) and the more dissimilar they are in terms of relative factor endowments.

### III.4 Estimates results

The equation has been estimated for the group of the eight CEECs as reporting countries and the EU 15 plus the 8 CEECs as trading partners.

Table 6 reports results of the test[53] and the estimates. AR(1) and AR(2) test show the consistency of the GMM estimator and the inconsistency of the OLS procedure. Hence, by introducing dynamics, the proper estimation method is the former one. Sargan test of over-identifying restrictions shows that the hypothesis that all moment restrictions are satisfied for dynamic specification is not rejected.

Not all the regressors are statistically significant and show the expected sign; between coefficients of major interest, agreement dummy between intra-Periphery, Centre and Periphery, and Luxembourg dummy coefficients are statistically significant. Also the "announcement effect" dummy seem to play a role in explaining bilateral trade flows.

53 Arellano and Bond (1991) propose a test of the hypothesis of no second-order serial correlation in the disturbances of the first differenced equation. This is a necessary condition for the valid instrumentation. The Arellano-Bond test performed for our estimate confirms that the GMM estimator is consistent. A test for the hypothesis of no first order–order serial correlation is also reported: the rejection of the null hypothesis (i.e. the presence of first-order serial correlation) indicates the inconsistency of the OLS estimator.

More in details:

i) "Gravity standard" variables. It is confirmed an inverse relationship between exports and distance. Sign of exporter counties GDP is negative; big differences between CEEC8 countries GDP (that are all exporters in our estimate) and the group of importer countries has had a detrimental role in explaining trade bilateral flows. The positive sign of relative country size index and the negative one of relative factor endowment index, although the latter is statistically not significant, confirms that trade relationships are higher the more similar two countries are in terms of country size and smaller the more dissimilar two countries are in terms of relative factor endowments. This latter result seems to support Linder's hypothesis, like in Baltagi et al. (2003). On the other hand, the positive sign of importer countries GDP is statistically significant.

Tab.III.6 Estimate of bilateral exports coming from CEECs-8, (1993-2003)

| Num.obs= 1712 | Num group=176 | F (216,1495) = 441.46 | Prob>F=0.000 | sample period 1990-2003 |
|---|---|---|---|---|
| | Coeff. | Std. Err. | t | P>\|t\| |
| $Ln(exp_{ij})$ t-1 | 0.4455 | 0.088 | 5.03 | 0.000 |
| $Ln(GDP_{it})$ | -0.355 | 0.142 | -2.50 | 0.013 |
| $Ln(GDP_{jt})$ | 0.195 | 0.087 | 2.23 | 0.026 |
| $Ln(DIST_{ij})$ | -1.08 | 0.172 | -6.30 | 0.000 |
| $Ln(SIMIL_{ijt})$ | 0.149 | 0.054 | 2.75 | 0.006 |
| $ENDOW_{ijt}$ | -0.047 | 0.063 | -0.75 | 0.455 |
| $VOL_{ijt}$ | -0.06 | 0.075 | -0.84 | 0.402 |
| $FTAEU_{ijt}$ | 0.105 | 0.064 | 1.63 | 0.103 |
| $FTAP_{ijt}$ | 0.135 | 0.062 | 2.16 | 0.031 |
| $Entr_{ijt}$ | 0.095 | 0.036 | 2.60 | 0.010 |
| $Lux_{ijt}$ | 0.095 | 0.052 | 1.84 | 0.066 |
| $Hels_{ijt}$ | 0.008 | 0.063 | 0.13 | 0.894 |
| $\alpha_t$ | Yes | | | |
| $\beta_j$ | Yes | | | |
| $\tau_{ij}$ t | Yes | | | |

Arellano-Bond test for AR (1) in first differences: z = -5.71 Pr>z = 0.000
Arellano-Bond test for AR (2) in first differences: z = 0.08 Pr>z = 0.934
Sargan test of over-identifying restrictions: chi2 (63) = 62.38 Prob> chi2 =0.498

ii) The lagged dependent variable is statistically significant until a 1-period lag; the magnitude of the "persistence effect" seems a little bit lower respect other findings based on more integrated and developed group of

countries (see De Nardis and Vicarelli (2003), Bun and Klassen (2002)). This gap can be explained by the fact that CEEC8 are less integrated than i.e. EU15 and by the inclusion of bilateral time trend in the regression, capturing part of "persistence effect".

iii) "Pure trade" variables: FTA-Per, FTA-EU. Both these free trade agreements dummies are positive and statistically significant (t=2.2, t=1,6). The coefficient shows that being part of a free trade agreement with respect to the case of not being part increases bilateral trade by more than 14% with respect to intra-periphery agreements and by more than 11% with respect to EA's on average[54].

iv) "EU membership" variables: EU membership, Luxembourg and Helsinki. Both Entrance and Luxemburg results positive and significant supporting the assumption of the existence of an anticipated effect on trade of participation in European Single Market. The magnitude of this effect seems to be relatively high. Differently the dummy Helsinky is not significant.

**Concluding remarks**

According to the findings of the previous paragraph the following results can be highlighted.

For what concern the "pure trade effect", Free Trade Agreements (FTA) matter in explaining bilateral export flows coming from CEECs: trade agreements dummies are positive and statistically significant.

Being part of a FTA with EU15 countries (Eas) increased CEECs bilateral trade by more than 11%; intra-periphery agreements increased trade around 14.% on average. The relatively lower impact on export flows of EAs than intra periphery FTA could be explained by the fact that, starting from the end of the eighties, trade between CEECs and EU 15 was already intense because reduction of trade barriers have already taken place.

Moreover, the CMEA (and for a while after its collapse in 1991) the trade relations between the CEECs have been driven by no economic factors and underdeveloped. Therefore, it is reasonable that the introduction of FTAs

54 Since the parameter of the dummy FTA are respectively 0.135 and 0.105, the variation of trade induced by being part of a trade agreement (FTA=1) with respect to the case of not being part of any agreement (FTA=0), i.e. [(EXP being part of a trade agreement /EXP not being part of ay trade. agreement) -1]x100 is given, other things being equal, by [(e0.135x1/ e0.135x0) –1]x100=14.4% and [(e0.105x1/ e0.105x0) –1]x100=11.1%

and RTAs were able to restore and develop them also within a broader EU framework.

It is worth to notice that estimates results seem to support the evidence coming from the data (see paragraph II). Starting from a very low level, the rate of growth of intra-periphery trade has been higher than core-periphery trade, ceteris paribus, because of an higher FTA impact. From this perspective, trade agreements between centre and periphery did not hamper trade relationship among periphery countries (no "hub and spoke" effect).

For what concern the "EU membership factor", the dummies Luxembourg and entrance are positive and significant suggesting that the trade flows coming from CEECs "embodied" in both cases the news of the future EU membership. However the attempt to estimate further the effect of the accession by mean of the introduction of exchange rate volatility in the estimates did not give any significant results.

# Appendix I

**Forbes and Rigobon (1999): Heteroscedasticity in market returns and cross-market correlation estimates.**

Forbes and Rigobon (1999), to underline the bias in the correlation coefficient simplify the model presented in paragraph I.3.2 (*Some econometric issues: Shift contagion or Interdependence?*)

They assume β=0 (no feedback between yt and xt) and zt=0 (no global exogeneous shocks). Given these assumptions the correlation coefficient is

$$\rho = \frac{\mathrm{cov}(x, y)}{\sqrt{VxVy}},$$

let us assume that a crisis arises in the market of x we will have that Vxc>Vx , and

$$\rho_{c=} \frac{\mathrm{cov}\, c(x, y)}{\sqrt{VxcVy}} = \frac{\alpha 2Vxc}{\sqrt{Vxc + V\varepsilon}} > \frac{\alpha 2Vx}{\sqrt{Vx + V\varepsilon}} = \rho(x, y) = \rho\,(\mathrm{x, y}).$$

Therefore:

$$\frac{\partial \rho c(x, y)}{\partial Vx} > 0.$$

The authors show that the bias could be measured as follows:

$$\rho = \frac{\rho c}{\sqrt{1 + \delta\left[1 - (\rho c)^2\right]}}$$

where ρc is the correlation coefficient biased and ρ is the one unbiased. δ is the relative increase of the variance of xt.

# Appendix II

## The Corsetti et al. model (1998): The baseline scenario

The following analysis study the effects of an unanticipated devaluation by country A on country B. Throughout the analysis, the Centre is assumed to maintain its monetary stance unchanged. Country B may decide to devalue to country A's devaluation[55].

1. **The case of full pass-through**

The author in the baseline scenario assume that there is full pass-through. In this case when country A devalues its currency against the Centre $E^A$ (the nominal exchange rate of A with respect to C) increases. The price of A's exports to the Centre falls below its competitor ($P^C_A < P^C_B$). If country B attempts to maintain its unilateral peg, the demand for the Periphery goods by the Centre falls exclusively on export from country A, and the demand of C for B's goods drops to zero.

Assuming that the law of one price holds the trade balance is

$$E^B P^C_C C^B_C = P^B_B C^C_B$$

for given $E^B$, $P^C_C$ and $P^B_B$, the fall in exports $C^B_C$ translates into a fall in imports $C^B_{C.}$

Now, the optimal consumption allocation for the consumers in country B:

$$M^B = 2 P^C_B C^B_C = 2 E^B P^C_C C^B_C$$

Shows that, for given domestic prices money demand (M) move one-to-one with import. Thus to avoid a devaluation, monetary authorities in country B must contract $M^B$ as much as $C^B_C$ falls. Since $C^B_B = M^B / P^B_B$, the monetary contraction implies a dramatic fall in domestic consumption and output. To sum up, an attempt by country B to maintain the peg entails a very large welfare cost: the country loses its export market and collapses under a process of rapid demonetisation of the economy[56].

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[55] Throughout the model, the superscripts of consumption indexes denote the country of the consumer and the subscripts denote the country of the producer.

[56] It is worth emphasizing that these corner solutions for the real and monetary equilibrium of country B are the consequence of the original assumption that goods of country A and B are perfectly substitutable from the vantage point of country C consumers. Relaxing such assumption leads to less extreme consequences without modifying the key message of the model.

Conversely, the demand of imports from the Periphery goods by the Center country increases after a devaluation by A. Namely since:

$$C^{C}_{B} = M^{C}/2P^{C}_{P} = M^{C}E^{A}/2P^{A}_{A}$$

the Centre's optimal consumption of Periphery goods rises at the same rate as $E^{A}$. With producers in b being driven out of the market, country A therefore experiences a record increase of its exports to the Centre, equal to

$$\Delta C^{C}_{A} = C^{C}_{B} + \Delta C^{C}_{P}.$$

Despite the adverse movements of the terms of trade, such an export boom allows the residents in A to increase their consumption of the Centre goods $C^{A}_{C}$. To show this, we rewrite the trade balance condition as:

$$C^{A}_{C} = (P^{A}_{A}/ P^{C}_{C})*(C^{C}_{P}/E^{A})*(C^{C}_{A}/C^{C}_{P})$$

and compare the equilibrium outcomes before and after country's A devaluation. Recalling that prices are sticky in the seller's currency and that the increase in the Centre's import from the Periphery is proportional to the changes in $E^{A}$, the increase of country A's consumption of the Centre's good is equal to:

$$\Delta C^{A}_{C} = (\Delta C^{C}_{A}/ C^{C}_{A} - \Delta C^{C}_{P}/ C^{C}_{P})* C^{A}_{C} = (1+ \Delta E^{A}/ E^{A})* C^{A}_{C}$$

Consumption of the Centre goods in country A more than doubles. Using this result together with the equilibrium conditions for country A's agents the authors see that, in equilibrium, the growth rate of money supply $M^{A}$ exceeds the devaluation rate. Given $P^{A}_{A}$ , this implies that consumption of local goods $C^{A}_{A}$ must increase as well.

Since the Centre country is assumed to keep its money supply fixed, the consumption of domestically produced goods $C^{C}_{C}$ does not change *vis-à-vis* the increasing import form the Periphery. Nonetheless, production of the domestic good $Y^{C}$ must now rise to match rise to match the higher external demand.

The consequences of the devaluation in country A are summarised in table 1. The subscript PEG means that all the effects are contingent on country B patenting to maintain the PEG.

The defense of the fixed exchange rate forces the monetary authorities of country B to lean against a vital adjustment in relative prices, and imposes a sharp contraction in domestic economic activity, consumption and welfare.

Table 1 The model under the PEG regime

| | | |
|---|---|---|
| $C^{A}_{APEG}\uparrow$ | $C^{A}_{CPEG}\uparrow$ | $Y^{A}_{PEG}\uparrow$ |
| $C^{B}_{B\ PEG}\downarrow$ | $C^{B}_{CPEG}\downarrow$ | $Y^{B}_{PEG}\downarrow$ |
| $C^{C}_{A\ PEG}\uparrow$ $C^{C}_{B\ PEG}\downarrow$ $\uparrow$ | $C^{C}_{CPEG}=$ | $Y^{C}_{PEG}\uparrow$ |

Country B suffers a loss in cost-competitiveness and, as consequence of the domestic liquidity crunch, the demand for country B's products collapses. Country A's devaluation is unambiguously beggar-thy-neighbor.

The scenario changes radically if country B decides to follow country A in devaluing its currency. By doing so, country B is able to restore its lost competitiveness and prevent the plunge in the level of economic activity and consumption. The resulting pattern of macroeconomic effects in the world economy is summarised in table 2, where DEV indexes the levels of the variables contingent on country B's devaluation.

Table 2 The model under the DEV regime

| | | |
|---|---|---|
| $C^{A}_{ADEV}\uparrow$ | $C^{A}_{CDEV}=$ | $Y^{A}_{DEV}\uparrow$ |
| $C^{B}_{B\ DEV}\uparrow$ | $C^{B}_{CDEV}=$ | $Y^{B}_{DEV}\uparrow$ |
| $C^{C}_{A\ DEV}\uparrow$ $C^{C}_{B\ DEV}\uparrow$ $\uparrow$ | $C^{C}_{CDEV}=$ | $Y^{C}_{DEV}=$ |

When the authors include the assumption of intra periphery trade and of perfect substitutability among periphery goods results change. With these two assumptions the cost competitiveness effect of a devaluation by A (hitting producers in B) coexists with a terms of trade effect (favouring consumers in B). Therefore direct intra-periphery trade makes the overall impact of a devaluation by country A potentially ambiguous[57].

2. **The case of no pass-through**

The authors revisit the analysis for the case in which prices are predetermined in terms of buyer's currency and thus there is no pass-through. Under such an assumption, the model simplifies significantly relative to the baseline scenario. From the money market equilibrium conditions the authors see that aggregate consumption moves in parallel to the money supply:

$$C^{i} \propto M^{i} \quad i = A, B, C$$

[57] To inspect further these issues the authors introduced a full-fledged intertemporal model which allows for intra-periphery trade, asymmetries in country size and finite elasticity of substitution among Periphery goods in the Center market. Such a framework will allow to analyze in detail the different roles played by bilateral trade vs. trade in third country in transmitting beggar-thy-neighbour policy shocks.

where $\propto$ denotes proportional to. In addition, any change in the level of consumption is evenly spread across all goods, as there are no changes in the relative prices faced by consumers:

$$C^i_j \propto C^i \quad j = A, B, C$$

In the Centre country, because of a fixed money supply $M^C$, the consumption of domestically produced and imported goods is not affected by devaluations in the Periphery. Thus, the balanced trade conditions imply:

$$C^A_C \propto E^A \ , \ C^B_C \propto E^B$$

In other words, for a Periphery country, a devaluation raises the revenue from exports in domestic currency. After a devaluation, domestic consumer can afford to consume more of all goods. Both exchange rates and consumption move together with the stock of money supply with unit elasticity.

So when A devalues, in presence of intra-periphery trade, the consumption gains accrue exclusively to A because of the increase in the real value of its export revenues, while the cost of devaluation in terms of increased labour effort are spread worldwide. Country A's devaluation is beggar-thy neighbour as it reduces revenues and profits of producers abroad.

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 the optimal response for country B is always to devalue.

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## Chapter I


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