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Essays on European Integration

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"Wäre die EU ein Staat, der die Aufnahme in die EU beantragen würde, müsste der Antrag zurückgewiesen werden - aus Mangel an demokratischer Substanz."

Martin Schulz
President of the European Parliament

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Abbreviations

AIC	**A**kaike **I**nformation **C**riterion
BNB	**B**ulgarian **N**ational **B**ank
CEEC	**C**entral and **E**astern **E**uropean **C**ountries
COICOP	**C**lassification **o**f **I**ndividual **Co**nsumption by **P**urpose
COMECON	**Co**uncil for **M**utual **Econ**omic Assistance
DM	**D**eutsche **M**ark
EB	**E**uro**b**arometer
EBRD	**E**uropean **B**ank for **R**econstruction **D**evelopment
EC	**E**uropean **C**ommunity
ECB	**E**uropean **C**entral **B**ank
EFSF	**E**uropean **F**inancial **S**tability **F**acility
EMU	**E**uropean Economic and **M**onetary **U**nion
ERM II	**E**xchange **R**ate **M**echanism
ESM	**E**uropean **S**tability **M**echanism
EU	**E**uropean **U**nion
FDI	**F**oreign **D**irect **I**nvestment
FEVD	**F**orecast **E**rror **V**ariance **D**ecomposition
GDP	**G**ross **D**omestic **P**roduct
GNP	**G**ross **N**ational **P**roduct
GOLR	**G**eneralised **O**rdinal **L**ogistic **R**egression
HICP	**H**armonized **I**ndex of **C**onsumer **P**rices
HQIC	**H**annan**Q**uinn **I**nformation **C**riterion
IDEA	**I**nstitute for **D**emocracy **E**lectoral **A**ssistance
IEA	**I**nternational **E**nergy **A**gency

IMF	**I**nternational **M**onetary **F**und
MLR	**M**ultinomial **L**ogistic **R**egression
NER	**N**ominal **E**xchange **R**ate
ODO	**O**verall **D**egree of **O**penness
OLR	**O**rdinal **L**ogistic **R**egression
OLS	**O**rdinary **L**east **S**quares
PA	**P**rincipal **A**gent
PPP	**P**urchasing **P**ower **P**arity
RER	**R**eal **E**xchange **R**ate
SBIC	**S**chwarz's **B**ayesian **I**nformation **C**riterion
SVAR	**S**tructural **V**ector **A**utoregressive **M**odel
US	**U**nited **S**tates
USD	**U**nited **S**tates **D**ollar
VAR	**V**ector **A**utoregressive **M**odel
WTO	**W**orld **T**rade **O**rganization

Chapter 1

Introduction

1.1 Motivation

The dynamics of European integration have gained momentum in recent years. As a response to the economic crisis, new responsibilities have been transferred to European authorities. The no-bailout rule incorporated in Art. 125 of the Treaty on the Functioning of the European Union has been largely disregarded: The European Financial Stability Facility (EFSF) was established in 2010 – a fund financed by the member states of the Eurozone and authorized to lend up to EUR 440 billion to Eurozone member states when necessary. In 2012 the European Stability Mechanism (ESM), a permanent firewall for the Eurozone with a lending capacity of EUR 500 billion, was added to the temporary EFSF. Moreover, starting on May 10, 2010 the European Central Bank (ECB) began purchasing government bonds of highly indebted Euro states. While in conflict with Art. 123, the majority in the ECB directorate legitimizes its decision with the need of intervention in order to assure the functioning of the monetary transmission mechanism and to stabilize the price level. As a result, the ECB has lost its independence to a large extent and has moved far away from the well-established model of the Bundesbank. The area of banking supervision will extend the competencies of the European Central Bank in 2014. Moreover, the so called "Sixpack" entered into force in 2011,

containing five regulations and one directive justified by the common objective of reducing public deficits and macroeconomic imbalances.

These examples and many others show that the European authorities have substantially changed or bypassed the rules of the game set at the beginning of the experiment called the European Economic and Monetary Union (EMU). The process of European integration has assumed new proportions and the subsidiarity principle has been largely disregarded. The EMU has lost attractiveness for still-non-member-countries, and Euro skepticism has reached historical levels. The discussion about introducing the right to leave EMU for Euro member states without leaving the European Union has gained importance.

This doctoral thesis represents an accumulation of articles on different topics from the broad research field of European economic and monetary integration. It addresses the issue of how desirable the EMU is and claims that a core monetary union with Germany, France, Belgium, Luxembourg, the Netherlands, Austria, Denmark and at most Slovenia would be more desirable than the current constellation of the EMU. Other member states in transition are less desirable members of the monetary union as their real exchange rates have experienced significant trend real appreciation since the beginning of transition. The driving forces of the real appreciation are examined in a detailed analysis showing that the real exchange rate has been largely driven by productivity growth, increasing demand for tradable goods and the progress in transition. In the second part, the process of European integration has been addressed from the political economy perspective. Trust in European and national institutions declined in the last decades and political mistrust and alienation of the population are calling the legitimacy of the political process into question. Empirical analyses show that the level of trust, as well as trust in national relative to European institutions, can be explained to a large extent by the existence of principal-agent problems in the structures of political institutions. The problem is more severe at the European than at the national level since distance to European institutions is much larger in direct and

figurative way.[1] The study is completed by an analysis of the monetary policy rule used by the Bundesbank as a potential prototype for the ECB.

This work does not claim to have covered all topics of European economic and monetary integration. However, it contributes to the discussion about the increasing integration dynamics by pointing out that integration should not be pushed forward at any price. First, the existing problems of the European Union should be addressed, including lack of transparency in the political process or contraventions against the rules of the game by some member states or European authorities. The flood tide of new rules and institutions that aim at intensifying the process of European integration in recent years are therefore largely misplaced. They have been enacted much too early and are the focus of broad criticism.

1.2 Structure and main findings

The next chapter is devoted to the question about desirability of monetary union. According to Vaubel (1976), currency unification is less desirable the more often real exchange rate adjustments are needed. Ten years later, Mussa reconsidered the high correlation between nominal and real exchange rate movements and presumed predominant influence of transitory factors on the development of real exchange rates (Mussa 1986). The application of the real exchange rate criterion for the viability of countries to form a monetary union should be based on real exchange rate variation that is not caused by short-lived shocks to nominal exchange rates. Using the methodology introduced by Blanchard and Quah (1989), the analysis examines the contribution of temporary and permanent shocks to the variation of real and nominal exchange rates among European countries. Imposing the restriction that temporary shocks should not affect the real exchange rate in the long run, the results of the structural vector autoregression analysis indicate that

[1] Due to e.g. spacial distance, long delegation chains, language barriers etc.

in most of the EU-15 countries nominal exchange rate flexibility was used as a means to effect real exchange rate adjustments before 1999. Based on the results, the most viable monetary union is of eight members: Germany, Austria, Belgium, Denmark, France, Luxembourg, the Netherlands and Slovenia. Furthermore, the empirical analysis applies the real exchange rate criterion to the Eastern enlargement of EMU and shows that giving up nominal exchange rate flexibility would be very painful for transition economies like Poland, Hungary and the Czech Republic as they have experienced strong real appreciation since the beginning of the transition process.

In the third chapter, the driving forces of real appreciation during the process of transition are analyzed using panel data of ten Central and Eastern European countries between 1993 and 2012. The real exchange rate is decomposed into two components: the real exchange rate of the external sector, i.e. the terms of trade, and the price of tradables in terms of nontradables. For the purpose of the empirical analysis, the economies are divided into a tradable and nontradable sector using the degree of openness of the main industries. The key results show that one explanation for the real appreciation is growth of productivity in the tradables sector, as described by Balassa (1964) and Samuelson (1964). Furthermore, increasing demand for luxury goods has also contributed to the real appreciation in transition economies. Luxury goods are mainly tradables in these countries and the real appreciation is brought about by an increase in the prices of tradables. Increasing private sector share in GDP and growth of investment have, on the contrary, weakened the real exchange rate appreciation, since they are associated with real depreciation. In the longer run, mainly factors related to the real convergence are expected to have influence on the real exchange rate in CEEC.

In the fourth chapter, the focus turns to some political economic aspects of European integration. The analysis investigates the determinants of trust in national and European political institutions. First, the concept of relative trust is introduced and a range of socio-cultural and political-economic factors are examined

for their impact on the level of trust in the national relative to the European Parliament on the one hand, and the national relative to the European executive on the other. The empirical analysis makes use of survey data from Eurobarometer and shows that socio-cultural and performance-based factors, perceived benefits and principal-agent problems explain the relative trust that the respondents have in the national and the EU institutions. Second, the effects of the current economic crisis on the determinants of trust in political institutions are analyzed. The process of centralization in the European Union accelerates significantly at times when trust in European governmental institutions reaches its historical minimum. The chapter investigates the driving forces of popular trust in national parliament and national government on the one hand, and the European Parliament, the European Commission and the Council of the European Union on the other. The panel analysis is based on semiannual data for 27 member states over the period 2004-2011. The results show decreasing trust in times of crisis. It is not only the outcome of poor economic conditions but it can also be viewed as dissatisfaction with crucial characteristics of the political regime and the structures of the European Union.

The last chapter analyzes the monetary policy rule of the Bundesbank. Several empirical studies suggest that the Bundesbank has pursued inflation targets rather than monetary targets. These studies have been criticized because they do not adequately measure the deviation from target and because they use some short-term interest rate as a measure of the Bundesbank's policy actions instead of the comprehensive measure, the monetary base adjusted for changes in reserve requirements. The analysis shows that, in the period from 1979 III to 1998 IV, changes in adjusted monetary base growth reacted negatively and significantly to deviations from target monetary expansion as measured relative to the nearest margin of the target band if, and only if, no control variables were added. With control variables, the significance of this coefficient drops to 10 percent. By contrast, deviations of the inflation rate from the inflation objective used to derive the money supply target never have any significant effect on changes in adjusted monetary

base growth. This result holds regardless of whether the lagged or the currently expected inflation rate is employed. The results are consistent with money supply targeting (if anything) but not with inflation targeting.

Chapter 2

Quo vadis Eurozone? A Reappraisal of the Real Exchange Rate Criterion

2.1 Introduction

The variation of real exchange rates (RER) as a criterion for the desirability of currency unification was introduced by Vaubel in the 1970s as the idea of creating a monetary union was launched within the structures of the European Community (see Vaubel 1976, 1978). As Vaubel pointed out, the flexibility of nominal exchange rates is an effective means of carrying out equilibrium real exchange rate adjustments. In inflationary situations the continuous adjustment of the nominal exchange rate (NER) can avoid real exchange rate instability and economic distortions. Furthermore, the largest fraction of real exchange rate variations take place through nominal exchange rate changes, if permitted. This stylized fact has also been confirmed in a range of studies, of which Mussa (1986) has gained the most popularity. Therefore, joining a monetary union is less desirable for countries in need of large real exchange rate adjustments.

In his analyses Vaubel (1976, 1978) compares RER changes among Community countries with those among regions or cities of three existing currency areas, Germany, Italy and USA. The results show that the variation of RER is significantly larger among Community countries. He refers to at least seven reasons for suspecting that the larger variance of Community RER is partly due to institutional factors which hamper the comparison of cross-country and within-country RER movements. However, Vaubel's analysis shows that RER changes are likely to be systematically correlated with the magnitude of the benefits stemming from currency unification.

Von Hagen and Neumann (1994) take up the results by Vaubel (1976, 1978) and compare the conditional variance and the persistence of RER shocks between Germany and eight European countries with those of RER shocks within the existing German monetary union. Using monthly series of consumer prices and nominal exchange rates over the time span of 1973-1989, they evaluate the RER criterion for desirability of currency unions, and show that "Europe of Two Speeds" existed at the time of their research with Germany, France and the small neighbors of Germany being a viable monetary union, whereas further reduction of RER variability was needed in order to include Denmark, Italy and the United Kingdom.

The methodology proposed by Von Hagen and Neumann (1994) has also been applied for the case of the Central and Eastern European Countries (CEEC). Kutan and Zhou (2008) investigate the conditional variance and persistence of RER changes between Germany as representing the EU standard and other EU member states. They extend the time span used by Von Hagen and Neumann (1994) through 2004, and evaluate the desirability of monetary union between EU-15 and the CEEC who joined the EU in 2004 and 2007. Their analysis also highlights the need for RER adjustment as an important criterion for the viability of the common currency area: the larger and more persistent RER changes are needed between the member states, the higher are the costs associated with the enlargement of the monetary union. Comparing five periods of different exchange rate arrangements,

they find that the variability and the persistence of RER shocks have declined significantly between the EU founding member states. Although the introduction of the common currency has reduced the variability of RER, Kutan and Zhou show that it is too early to enlarge the monetary union by including the new EU-member states. In the jargon of Von Hagen and Neumann (1994), they refer to an "EU of three speeds". At the time of their research Cyprus, Malta, Estonia, and Slovenia had already met the desirability conditions for entering the Eurozone, including low variability and persistence of RER shocks, as well as high degree of monetary policy coordination.

The publication of these research results has been of considerable political significance in the context of EMU enlargement. Furthermore, the current discussion about the most appropriate way out of the economic crisis can benefit from this comprehensive methodology for analyzing the costs of being a member of a monetary union. The aim of the present chapter is to contribute to the discussion about the desirability of monetary unification within the European Union by reconsidering the real exchange rate criterion as proposed by Vaubel (1976, 1978). First, the empirical analysis investigates the persistence of real exchange rate movements vis-a-vis Germany using a range of different measures. The results point toward a substantial mean reverting component in a number of countries. Therefore, the observed high correlation between nominal and real exchange rate movements can result from transitory influences on the development of real exchange rates (see e.g. Mussa 1986). In such a case, the variability of real exchange rates is less conclusive with regard to the disadvantages stemming from currency unification. If the high RER variability is caused by short-lived shocks to the nominal exchange rate, then it could be argued that nominal exchange rate flexibility is less desirable since it causes movements away from the equilibrium path. However, in case that the variability of real exchange rates is caused mainly by permanent shocks, the real exchange rate criterion can be applied as proposed by Vaubel (1976, 1978).[1]

[1]The importance of the decomposition of real exchange rate variation into a component due to monetary or temporary causes and a component due to real causes has been also stressed by Vaubel in a later publication (see Vaubel 2003, footnote 34).

Using the methodology introduced by Blanchard and Quah (1989), the present analysis examines the influence of temporary and permanent shocks on the variation of real and nominal exchange rates among European countries. Imposing the restriction that temporary shocks should not affect the real exchange rate in the long run, the analysis indicates that in most of the EU-15 countries nominal exchange rate flexibility was used as a means to effect real exchange rate adjustments before 1999. Based on the results, the most desirable monetary union of eight member states should be between Germany, Austria, Belgium, Denmark, France, Luxembourg, Netherlands and Slovenia. Further on, the empirical analysis applies the real exchange rate criterion to the Eastern enlargement of EMU and shows that giving up the nominal exchange rate flexibility would be very painful for the countries of Central and Eastern Europe.

This chapter is organized as follows. The next section analyzes the persistence of real exchange rates between Germany and the other EU countries. Section 2.3 presents the methodology of the empirical approach for the decomposition of RER and NER variation into a transitory and a permanent component. Section 2.4 contains the results of the empirical analysis. Concluding remarks are offered in Section 2.5.

2.2 Real exchange rate persistence

Before proceeding with the analysis of RER persistence a closer look at the data provides valuable insights about its time series features. A plot of all real and nominal exchange rates against Germany as representing the standard of the EU is provided in Figure A2.1 in the Appendix. The real exchange rate is calculated as follows:

$$Q_t = E_t \frac{P^*}{P}, \tag{2.1}$$

whereas E denotes the nominal exchange rate, P^* the price level in the foreign country, and P the price level in the home country. The data is taken from the IMF International Financial Statistics database. It includes monthly, seasonally unadjusted observations on nominal exchange rates and consumer prices from January 1973 to September 2011[2]. The nominal exchange rate vis-a-vis Germany is defined as the price of the Deutsche Mark (or the Euro) in terms of the particular home currency. Both, nominal and real exchange rates are expressed as indices with January 2005 serving as a base.

Aside from the overall trend of the series, the nominal exchange rate exhibits a pattern similar to that of the real exchange rate in most of the current EMU member states before the adoption of the Euro. However, some notable exceptions are apparent from Figure A1. Austria and the Netherlands, for instance, exhibit real exchange rate adjustment without significant nominal exchange rate movements, since they chose to stabilize their nominal exchange rates against the Deutsche Mark since the early 1980s. A similar development has been observed in Estonia due to the currency board arrangement adopted almost immediately after introducing the Estonian Kroon.

The common overall pattern of real and nominal exchange rate movements can also be observed in the remaining member states which (still) have not joined the EMU. Besides countries like Bulgaria, Latvia and Lithuania, where fixed exchange rate regimes do not allow for nominal exchange rate adjustment, much of the real exchange rate variation is reflected by the development of the nominal exchange rates, or vice versa.

The launch of the common European currency has marked the beginning of a period characterized by minor real exchange rate variation in most of the countries. Nevertheless, many of the currencies have experienced a continous real appreciation vis-a-vis Germany which occurred through inflation rates in excess of

[2]However, producer prices were used in the case of Ireland and United Kingdom, since comparable consumer prices were not available for these countries over the whole time period.

the German inflation rate. As stated above, real exchange rate adjustments can be achieved in a less painful way if nominal exchange rate flexibility is granted. Therefore, estimation of the costs of giving up the national currency should consider the extent to which nominal exchange rate flexibility has effectively been used as an adjustment mechanism, as well as the actual need for real exchange rate adjustment.

The calculation of RER persistence serves as a suitable starting point of the analysis since it can be used as a rough approximation of the need for real exchange rate adjustments. Considering that the RER persistence is inversely proportional to the speed of mean reversion after a particular shock, it delivers valuable information about the kind of shocks driving the overall real exchange rate movements. For instance, high persistence values, respectively high values for the half life of RER disturbances, are likely to be observed if the development of the real exchange rate is mainly driven by permanent shocks. In terms of the real exchange rate criterion for the desirability of currency unification, the costs of giving up the national currency are higher, the higher the RER persistence between the particular countries.

The majority of Purchasing Power Parity studies calculate the RER persistence assuming that real exchange rate dynamics can be best described as an AR(1) process, as represented by the following equation (see e.g. Imbs et al. 2005, Choi et al. 2004):

$$q_t = c + \rho q_{t-1} + \epsilon_t. \tag{2.2}$$

q_t represents the logarithm of the real exchange rate, c is a constant term and ϵ_t denotes the disturbance term. The estimated autoregression coefficient $\hat{\rho}$ can then be used to calculate the half-life of deviations from Purchasing Power Parity (PPP). The half-life $T_{1/2}$ is defined as the number of periods needed for half the effect of a particular shock to dissipate. The half-life can be derived using the

following standard formula:

$$T_{1/2} = \frac{ln(0.5)}{ln(\hat{\rho})}. \tag{2.3}$$

This conventional procedure is also applied in the present analysis. Columns (1) and (2) of Table 2.1 report the estimated values of $\hat{\rho}$ and $T_{1/2}$ for the EU countries vis-a-vis Germany. The half-life was calculated, using monthly observations of the real exchange rates in logarithms and then transformed into years needed for half of the given shock to dissipate.

The overall results presented in columns (1) and (2) of Table 2.1 can be summarized as follows. The half-life of shocks to the real exchange rate ranges from about one year in Bulgaria to 192.5 years in Estonia. As a whole, the higher AR(1) coefficients, implying high RER persistence and therefore little reversion, are observed in the transition economies (the only exceptions being Romania, Bulgaria, and Slovenia). This is an expected outcome, since these countries have experienced substantial real appreciations in recent years and their real exchange rates contain therefore large trend components.[3] Although the fixed exchange rate arrangements in some of these countries have dampened the short-term variability of real exchange rates, the real appreciation due to productivity growth as in the framework of Balassa (1964) and Samuelson (1964) and other real factors is expected to bring about higher autoregression coefficients than e.g. in Luxembourg.[4] The RER persistence in Slovenia is similar to that of many EU-15 countries. The low half-life values in Bulgaria and Romania are probably due to the economic turbulences at the beginning of the transition process. Within the EU-15 countries the half-life of RER shocks is relatively low, with Austria as an exception.[5] Somewhat higher values of about ten years have been estimated for countries like Denmark, Portugal and Spain.

[3] See Chapter 3 of this thesis.

[4] For a discussion about potential explanations for the real appreciation in CEEC see among others Boeva (2009), Egert et al. (2005), as well as Chapter 3 of the present thesis.

[5] The high RER persistence in Austria is not surprising, since it is the result of continous real appreciation vis-a-vis Germany.

TABLE 2.1: Real exchange rate persistence in the EU vis-a-vis Germany (until Sept. 2011)

Country	N	$\hat{\rho}$ (1)	half life (2)	β $k=12$ (3)	β $k=24$ (4)	β $k=36$ (5)	β $k=48$ (6)	β $k=60$ (7)
Austria	464	.9993***	82.5	.228***	.217***	.259***	.425***	.440***
Belgium	464	.9854***	3.9	-.042	-.243***	-.318***	-.420***	-.606***
Bulgaria	248	.9364***	.9	.052	.144***	.209***	.289***	.301***
Cyprus	464	.9890***	5.2	-.002	.071*	-.183***	.009	-.175***
Czech Rep.	224	.9992***	72.2	-.062	.367***	.232**	.060	.072
Denmark	464	.9949***	11.3	-.079***	-.144***	-.148***	-.147***	-.178***
Estonia	231	.9997***	192.5	.637***	.423***	.228***	.142***	.112***
Finland	464	.9919***	7.1	.076**	-.337***	-.371***	-.211***	-.191***
France	464	.9692***	1.8	-.129***	-.570***	-.479***	-.252***	-.358***
Greece	464	.9911***	6.5	-.279***	-.143***	-.143***	-.244***	-.349***
Hungary	428	.9977***	25.1	.125**	-.010	.130***	-.008	-.142***
Ireland	446	.9774***	2.5	-.165***	-.079*	.101**	-.066	-.193***
Italy	464	.9885***	5.0	.052	.041	-.172***	-.192***	-.192***
Latvia	235	.9992***	72.2	.482***	.297***	.260***	.203***	.086***
Lithuania	225	.9995***	115.5	.332***	.434***	.270***	.198***	.136***
Luxembourg	464	.9853***	3.9	.001	-.259***	-.293***	-.265***	-.166***
Malta	463	.9908***	6.2	.153***	.110**	-.095*	-.329***	-.410***
Netherlands	464	.9845***	3.7	-.083***	-.238***	-.316***	-.278***	-.267***
Poland	284	.9943***	10.1	-.367***	-.018	.236***	.292***	.365***
Portugal	464	.9951***	11.8	-.071**	-.371***	-.262***	-.010	.015
Romania	251	.9665***	1.7	-.255***	-.218***	.279***	.408***	.339***
Slovak Rep.	224	.9995***	115.5	.391***	.691***	.922***	1.002***	1.127***
Slovenia	237	.9945***	10.5	-.044	.123	-.348***	-.570***	-.494***
Spain	464	.9938***	9.3	-.068**	-.192***	-.167***	-.259***	-.380***
Sweden	464	.9855***	4.0	-.189***	-.594***	-.350***	-.275***	-.224***
UK	463	.9907***	6.2	-.057	-.056	.000	-.255***	-.392***

$\hat{\rho}$ denotes the first order autoregression coefficient.
β represents the persistence of RER changes as in Huizinga (1987).
The reported half life is in years.
*/**/*** indicate respectively 1%/5%/10% significance level of the coefficients.

The measurement of RER persistence by the half-life of shocks to the real exchange rate derived from the coefficient of an AR(1) process has become a standard in the literature examining the validity of Purchasing Power Parity. In addition, further extensions of the autoregressive process have been proposed to estimate the longevity of shocks to the real exchange rate, including the estimation of AR(p) models (e.g. Mark 2001) and the utilization of impulse response functions (see among others Cheung and Lai 2000, Kilian and Zha 2002, Murray and Papell 2002). A slightly different application of the autoregressive process in the context of RER persistence has been proposed by Huizinga (1987). He suggests to estimate the share of the shocks that can be expected to be reversed in a given period. The

methodology involves estimating the regression model:

$$q_{t+k} - q_t = \beta_k(q_t - q_{t-k}) + \epsilon_t, \tag{2.4}$$

the interpretation being as presented below. A coefficient $\beta = -1$ would imply that 100% of any real appreciation or depreciation over the last k years can be expected to be reversed in the following k years. In his analysis Huizinga estimates β for different k values and shows that the mean-reverting component in RER becomes weaker with decreasing time interval. Columns (3)-(7) of Table 2.1 present the estimated values of β for the case of EU countries for $k = 12, 24, 36, 48, 60$ months. In some countries like France, Belgium and the Netherlands the relatively low half-life of shocks to the real exchange rate are also confirmed by the negative β coefficients, regardless of the horizon for which they were estimated. In Poland the low RER persistence based on the AR(1) process estimates for the levels can be observed for small k as well. However, as the time interval increases the β values become positive, indicating that shocks are more persistent than the calculated half-life suggests. In Bulgaria and Romania, where extremely low half-life values were observed, in spite of trend real appreciation, the β values suggest RER persistence far exceeding that calculated from the AR(1) estimation of the levels. For large k the β values become positive and highly significant. In the other transition economies the estimated β values are positive and significant, therefore confirming the high RER persistence in these countries.

To sum up, the analysis indicates significantly higher levels of RER persistence in CEEC than the average (with Slovenia being a notable exception) with the lowest levels in Belgium, France, Luxembourg and the Netherlands. Based on these results the costs of currency unification are the lowest in the latter countries, implying that according to this methodology they form a more desirable monetary union with Germany than most CEEC countries. The results indicate that most transition economies will have to accept high costs by adopting the common European currency in the near future. They should wait until their real appreciation slows down considerably. Moreover, the results show that in many current EMU

member states nominal exchange rate flexibility would have been a valuable instrument for real exchange rate adjustment. For instance, Portugal and Spain exhibit relatively high AR(1) coefficients and the analysis of the β values indicate that only about one-third of a shock to the real exchange rate over the last five years is expected to be reversed in the next five years.

2.3 The empirical model

The high levels of real exchange rate persistence in many countries have led to a large body of literature trying to explain the slow mean reversion process. Attempts to investigate the so called PPP Puzzle, i.e. the extremely slow rate at which shocks to the real exchange rate seem to cancel out, consider for instance sticky price models as explanation. As a result of monetary shocks, immediate adjustments of nominal exchange rates are associated with large real exchange rate movements since national price levels adjust slowly. The main reason is the binding character of long-lasting contracts. In his influential paper, Mussa (1986) has pointed out that sluggish price adjustment must be the main explanation for the short-term movements in real and nominal exchange rates. However, Bergin and Feenstra (2001), Chari et al. (2002), Huizinga (1987), Kollmann (2001) and Tille (1998) among others have shown that only extremely long-ranging contracts can explain the observed persistence.

Chari et al. (2002) investigate the effect of monetary shocks on real exchange rates in a two-country sticky price model with price-discriminating monopolists. Their analysis reproduces the observed volatility in RER, assuming one-year contracts, but it cannot generate the high persistence observed in the data. Bergin and Feenstra (2001) use a model with translog preferences, which amplify the effect of price stickiness in generating persistence. However, their analysis also points out the duration of contracts should be at least 2-3 years in order to generate the very high persistence of real exchange rates. As further explanation Benigno (2004)

proposes to reinterpret the way monetary policy is conducted in order to reproduce the deviations from PPP. Endogenous monetary policy designed in a way to smooth disturbances in the real economy can interact with nominal price stickiness in a complementary way to generate RER persistence as observed in the data.

Regardless of the source of real exchange rate persistence, it is a well accepted fact that monetary policy brings about substantial real exchange movements. Bergin and Feenstra (2001) and Chari et al. (2002) estimate an average autocorrelation of the real exchange rate amounting to about 0.8 over the period of one quarter, with a standard deviation between four and five times that of real output. Although some part of the real exchange rate persistence is brought about by real factors, there is a substantial part which can be ascribed solely to monetary policy.

Clarida and Gali (1994) examine the role of monetary policy for four countries vis-a-vis the US dollar. Using the approach pioneered by Blanchard and Quah (1989) they estimate a three-equations open macro model in the spirit of Dornbusch (1976) and Obstfeld (1985). Especially for the case of Germany and Japan they show that monetary shocks explain a substantial amount of the variance of the US dollar RER: more than 41% of the variance of the USD/DM real exchange rate and more than 35% of the USD/YEN real exchange rate can be ascribed to monetary shocks at a twelve-month horizon. The main core of their results has been confirmed by Rogers (1999) and Faust and Rogers (2003). In several alternative VAR specifications with five variables Rogers (1999) analyzes the GBP/USD real exchange rate using over a hundred years of data. Depending on the specification, the real exchange rate variability in the short run (twelve months) ascribed to monetary shocks ranges between 19% and 60%, with a median contribution of 40.6%. Faust and Rogers (2003) estimate a seven-variables model as in Eichenbaum and Evans (1995) and analyze the effect of monetary shocks over a 48-months horizon. The results point toward a variance share of over 50% that can be attributed to monetary shocks. Even in a further specification with fourteen variables the variance share of monetary shocks remains substantial, about one-third.

The examination of sources for RER movements using the Blanchard/Quah methodology within a multivariate framework requires imposing a wide range of constraints, many of which are questionable. In the present analysis the methodology is applied in a bivariate framework using only the real and nominal exchange rates in order to investigate the sources of real exchange rate movements and the costs of giving up the national currencies in Europe by placing only one restriction, namely that, in the long run, the real exchange rate is not affected by nominal and temporary real shocks.

More specifically, the empirical approach focuses on decomposition of real exchange rate variation into two components, permanent and transitory. In their seminal paper Blanchard and Quah (1989) proposed a method to identify the dynamic effects of supply and demand shocks on real GNP and unemployment. Blanchard and Quah apply a bivariate structural vector autoregressive model (SVAR) imposing a long-term restriction as strategy for identification. Lastrapes (1992) introduces a natural extension of the estimation technique applied by Blanchard and Quah (1989) to the study of exchange rate behavior. Using monthly IMF data between 1973 and 1989, Lastrapes investigates the driving sources of nominal and real exchange rates between the United States on the one hand and Germany, Japan, Italy and Canada on the other.[6] His findings indicate that nominal and real exchange rate fluctuations were mainly caused by real shocks between 1973 and 1989. Therefore Lastrapes concludes that nominal exchange rate flexibility is required to facilitate the changes in relative prices across borders and efficient allocation of resources.

In the following, a brief overview of the estimation procedure is presented before proceeding to the empirical results regarding the EU countries. Consider the

[6]Originally the data set used by Lastrapes included the United Kingdom as well. However these series were dropped from further consideration after investigating the stationarity of the exchange rates. See below.

following bivariate stable vector autoregressive process

$$\Delta y_t = A_0 \Delta y_t + A_1 \Delta y_{t-1} + A_2 \Delta y_{t-2} + ... + A_k \Delta y_{t-k} + u_t, \tag{2.5}$$

where

$$\Delta y_t = \begin{bmatrix} \Delta q_t \\ \Delta e_t \end{bmatrix}$$

represents the vector of the endogenous variables in first differences. e_t is the logarithm of the nominal exchange rate defined as the price of the foreign currency in home currency units. q_t is the log of the real exchange rate,

$$q_t = e_t + p_t^* - p_t, \tag{2.6}$$

with p_t and p_t^* denoting the logarithms of the price levels in the home and in the foreign country, respectively. $A_0, A_1 ... A_q$ represent matrices of parameters with

$$A_0 = \begin{bmatrix} 0 & a_{02} \\ a_{03} & 0 \end{bmatrix}.$$

The contemporaneous covariance matrix of disturbances is given by Ω, with

$$\Omega = E[u_t u_t'] = \begin{bmatrix} \omega_{11} & 0 \\ 0 & \omega_{22} \end{bmatrix}.^{7}$$

The disturbances contained in the vector u_t are assumed to be white noise and represent two fundamental structural shocks as pointed out in the discussion below. The reduced form of the linear dynamic structural model can be represented as

[7] Placing the zero restrictions in A_0 and Σ is convenient normalization in the VAR literature. For further discussion of VAR and SVAR models see among others Amisano and Giannini (1997), Luetkepohl (2005), Stock and Watson (2001) and Watson (1994).

follows:

$$\begin{aligned}\Delta y_t &= (I - A_0)^{-1} A_1 \Delta y_{t-1} + (I - A_0)^{-1} A_2 \Delta y_{t-2} \\ &\quad + ... + (I - A_0)^{-1} A_k \Delta y_{t-k} + (I - A_0)^{-1} u_t \\ &= \Pi_1 \Delta y_{t-1} + \Pi_2 \Delta y_{t-2} + ... + \Pi_k \Delta y_{t-k} + \epsilon_t, \end{aligned} \tag{2.7}$$

with

$$\Sigma = E[\epsilon_t \epsilon_t'] = \begin{bmatrix} \sigma_{11} & \sigma_{12} \\ \sigma_{12} & \sigma_{22} \end{bmatrix}.$$

Equation (2.7) is a convenient starting point of the analysis because its parameters can be estimated together with the variance-covariance matrix Σ in a straightforward way using ordinary least squares as a vector autoregression model (VAR). The moving average representation of the derived VAR model expresses the endogenous variables in Δy_t as a function of current and past innovations ϵ_t and can be obtained by solving equation (2.7) for the final form of Δy_t,

$$\Delta y_t = (I - \Pi_1 L - \Pi_2 L^2 - ... - \Pi_k L^k)^{-1} \epsilon_t = \begin{bmatrix} C_{11}(L) & C_{12}(L) \\ C_{21}(L) & C_{22}(L) \end{bmatrix} \begin{bmatrix} \epsilon_{1t} \\ \epsilon_{2t} \end{bmatrix} = C(L)\epsilon_t. \tag{2.8}$$

$C(L)$ is the matrix of long-run responses of Δy to exogenous shocks, whereas each element of the matrix is an infinite order lag polynomial.

To demonstrate the interpretation of the elements in $C(L)$ equation (2.8) can be represented as:

$$\begin{bmatrix} \Delta q_t \\ \Delta e_t \end{bmatrix} = \begin{bmatrix} \epsilon_{1,t} \\ \epsilon_{2,t} \end{bmatrix} + \begin{bmatrix} C_{11,1} & C_{12,1} \\ C_{21,1} & C_{22,1} \end{bmatrix} \begin{bmatrix} \epsilon_{1,t-1} \\ \epsilon_{2,t-1} \end{bmatrix} + \begin{bmatrix} C_{11,2} & C_{12,2} \\ C_{21,2} & C_{22,2} \end{bmatrix} \begin{bmatrix} \epsilon_{1,t-2} \\ \epsilon_{2,t-2} \end{bmatrix} + ... \tag{2.9}$$

The coefficient $C_{11,2}$ represents for instance the response of Δq in period $t+2$ to a unit innovation in ϵ_1 occuring in period t, whereas all other shocks at all other dates are held constant. Therefore, the function $C_{11,s}(s)$ is the impulse response function and shows the response of Δq in time to a unit innovation in ϵ_1.

Although reduced form VAR can be used to estimate the coefficients in $\Pi_1, ..., \Pi_q$, the information delivered by the VAR estimations is not sufficient to investigate the effect of the structural shocks contained in the vector u_t on the levels of the variables and the first differences. Even though the impulse response functions given by the matrix C show the response of the differenced nominal and real exchange rates to the reduced form disturbances, ϵ_1 und ϵ_2, it is the response to the structural innovations u_1 and u_2 which is of particular interest. The reduced form disturbances are only a linear combination of the structural innovations, as defined in equation (2.7) above:

$$(I - A_0)^{-1} u_t = \epsilon_t. \tag{2.10}$$

Therefore, the moving average representation of the model can be rewritten as:

$$\Delta y_t = C(L)(I - A_0)^{-1}(I - A_0)\epsilon_t, \tag{2.11}$$

or

$$\Delta y_t = \hat{C}(L) u_t, \tag{2.12}$$

whereas $\hat{C}(L) = C(L)(I - A_0)^{-1}$ contains the impulse response functions of the nominal and real exchange rates in first differences to the structural innovations u_1 and u_2. In order to calculate $\hat{C}$, A_0 needs to be known. A further restriction is needed and it can be derived from the long-run neutrality of transitory shocks on the real exchange rate. Under the assumption that u_1 represents permanent

shocks and u_2 transitory shocks, this restriction implies that

$$\lim_{k\to\infty} \frac{\partial q_t}{\partial u_{2,t-k}} = 0. \tag{2.13}$$

This restriction is equivalent to setting the accumulated effect of the transitory shock on Δq_t equal to zero. It should, however, be kept in mind that the imposed restriction is not testable, since it does not overidentify the structural model. Thus, the methodology introduced by Blanchard and Quah (1989) decomposes the variation of real and nominal exchange rates within a SVAR framework into a transitory and a permanent component.[8]

The estimated coefficients can then be used to decompose the overall real exchange rate. The structural shocks can be calculated from the disturbances of the VAR model after imposing the long-run neutrality condition for the transitory shock:

$$u_t = (I - A_0)\epsilon_t. \tag{2.14}$$

The real exchange rate driven by permanent shocks in the absence of transitory shocks can be obtained by replacing the transitory shocks contained in u_2 by zero.

2.4 Estimation results

For the purpose of the empirical analysis, the time series calculated from IMF data as described in Section 2.2 have been converted into logs and expressed as first differences. Preconditions for the estimation of the SVAR model are a stationary vector process Δy_t and no cointegrating relationship between q_t and e_t. In most of the cases nonstationarity of Δy_t and cointegration of the exchange rates in levels appeared nonproblematic.[9] However, the null of nonstationarity can be

[8]The application of the Blanchard/Quah framework has led in the literature to the interpretation of the transitory (permanent) component as nominal (real) shock. However, there are some potential problems with this interpretation. For further details see Lastrapes (1992).

[9]The results of the modified ADF test for nonstationarity as well as those of the Engle-Granger test procedure for cointegration are reported in Tables 2.2 and 2.3.

TABLE 2.2: Test statistics from the modified ADF test for cointegration and nonstationarity of NER and RER in levels and first differences: EU-15 (1973-1998)

Country	NER		RER		Cointegration test
	levels	Δ	levels	Δ	(Engel-Granger)
	(I)	(II)	(III)	(IV)	(V)
Austria	-3.478(1)**	-8.986(1)***	-.902(1)	-7.393(4)***	-4.286(1)***
Belgium	-.635(1)	-9.868(1)***	-2.347(1)	-8.772(1)***	-.288(1)
Finland	-1.793(1)	-4.915(4)***	-1.223(1)	-4.238(4)***	-1.668(1)
France	-.511(1)	-9.880(1)***	-3.885(1)***	-10.440(1)***	-1.475(1)
Greece	-.770(1)	-6.145(1)***	-2.659(6)*	-2.233(11)	-1.976(4)
Ireland	-.158(1)	-3.093(6)**	-2.885(1)*	-5.934(1)***	-.793(1)
Italy	-.530(1)	-3.628(5)***	-2.045(1)	-6.482(1)***	-1.691(1)
Luxembourg	-.635(1)	-9.868(1)***	-2.974(1)**	-4.775(4)***	-2.974(1)**
Netherlands	-1.517(2)	-10.598(1)***	-1.522(1)	-9.511(1)***	-1.023(1)
Portugal	.442(1)	-7.219(2)***	-2.277(1)	-9.621(1)***	-1.424(1)
Spain	-.959(1)	-9.861(1)***	-1.717(1)	-7.970(1)***	-2.626(1)*
Denmark	-.020(1)	-11.035(1)***	-2.086(1)	-11.807(1)***	-3.120(1)
Sweden	-2.325(1)	-8.136(1)***	-2.672(1)*	-7.777(1)***	-.556(1)
UK	-1.194(1)	-8.956(1)***	-2.542(1)	-7.428(1)***	-1.921(1)

*/**/*** indicate respectively 1%/5%/10% significance level for rejecting the null hypothesis of non-stationarity.

TABLE 2.3: Test statistics from the modified ADF test for cointegration and nonstationarity of NER and RER in levels and first differences: CEEC (1993-2006) and Cyprus and Malta (1973-2006)

Country	NER		RER		Cointegration test
	levels	Δ	levels	Δ	(Engel-Granger)
	(I)	(II)	(III)	(IV)	(V)
Czech Rep.	-1.478(1)	-6.428(1)***	-2.104(1)	-7.323(1)***	-.676(1)
Hungary	-.109(1)	-6.197(1)***	-1.843(1)	-3.944(1)***	-.728(1)
Poland	-.394(1)	-7.512(1)***	-1.903(1)	-8.347(1)***	-1.207(1)
Romania	.084(1)	-8.129(1)***	-2.031(2)	-6.253(2)***	-2.004(1)
Slovakia	-.620(1)	-7.049(1)***	-2.031(2)	-6.253(2)***	-.711(1)
Slovenia	.547	-5.719(1)***	-2.528(1)	-6.886(1)***	-.405(1)
Cyprus	-1.743(1)	-8.170(1)***	-2.418(12)	-1.526(11)	-2.049(1)
Malta	-1.594(5)	-1.004(1)	-1.649(12)	-2.515(11)	-1.593(5)

*/**/*** indicate respectively 1%/5%/10% significance level for rejecting the null hypothesis of non-stationarity.

rejected in some countries for the levels of nominal or real exchange rates. In particular in Austria, France and Luxembourg the results should be interpreted with caution, since overdifferencing of the exchange rates makes the application of the Blanchard-Quah approach less appropriate for these countries.

In the following the dynamic effects of transitory and permanent shocks on exchange rates have been analyzed. The unrestricted VAR has been estimated for $n = 12$.[10] Besides the constant and a deterministic trend, seasonal dummies have

[10]The optimum lag-length according to the Schwarz's Bayesian information criterion turned out to be 1 in most of the cases. However, the implementation of the Lagrange-multiplier test showed considerable autocorrelation of the residuals. Therefore the number of lags included has been increased in order to account for remaining autocorrelation and set uniformly to 12 to assure comparability of the results.

been included in some cases, since the time series exhibit strong seasonal patterns in some countries. Subsequently, SVAR has been estimated placing the neutrality long-term restriction in the equation of the real exchange rate.

Figures A2 in the Appendix depicts the responses of real and nominal exchange rates to permanent and transitory shocks in the EU-15 countries.[11] The long-term effect of transitory shocks on RER approaches zero due to the neutrality restriction imposed. In many countries, both real and nominal exchange rates in the short run exhibit a pattern consistent with the overshooting hypothesis of the 1970s.[12] The peak is reached after about 6-12 months in Austria, Belgium, Finland, France and Spain and much sooner in the remaining countries. It is followed by gradual decline of the nominal exchange rate toward the long-term value. Remarkable exceptions from this pattern can be observed in Greece, Luxembourg and Portugal, where the responses increase steadily until the long-term values are reached. In all countries the long-term responses of nominal exchange rates to transitory shocks are strongly positive, indicating that nominal shocks are absorbed also by the nominal exchange rates over time and not solely by the price levels. The real exchange rate returns to its initial value after approximately 1.5-3.5 years.

Of great relevance for the implementation of the real exchange rate criterion is further the response of nominal and real exchange rates to permanent shocks. In most of the countries the pattern of the dynamic response of nominal exchange rates to permanent shocks is very similar to that of the real exchange rate. Therefore nominal exchange rate flexibility has indeed been used as an adjustment mechanism for permanent changes in the real exchange rate. The long-term responses to the different shocks are also presented in Table 2.4. In order to investigate the challenges associated with the adaptation to the situations with common currency, the last column of Table 2.4 reports the share of long-term response of real exchange rates, which has been carried out by nominal rate adjustments. The results indicate that

[11] The dashed lines represent the 95% confidence interval from a bootstrap simulation with 500 replications.

[12] See e.g. Dornbusch (1976).

TABLE 2.4: Long-term responses of real and nominal exchange rates in EU-15 to permanent and transitory shocks (1973-1998)

Country	Response of RER to a permanent shock (1)	Response of RER to a transitory shock (2)	Response of NER to a permanent shock (3)	Response of NER to a transitory shock (4)	share of permanent shock to RER accounted for by NER (3)/(1)·100%
Austria	.0051	.0000	.0022	.0023	43.1
	(.0012)		(.0008)	(.0006)	
Belgium	.0093	.0000	.0076	.0066	81.7
	(.0020)		(.0028)	(.0022)	
Finland	.0382	.0000	.0321	.0057	84.0
	(.0114)		(.0093)	(.0016)	
France	.0121	.0000	.0108	.0073	89.3
	(.0022)		(.0027)	(.0025)	
Greece	.0139	.0000	.0222	.0229	159.7
	(.0034)		(.0113)	(.0089)	
Ireland	.0159	.0000	.0112	.0116	70.4
	(.0036)		(.0045)	(.0027)	
Italy	.0216	.0000	.0184	.0056	85.2
	(.0053)		(.0047)	(.0011)	
Luxembourg	.0082	.0000	.0095	.0067	115.9
	(.0018)		(.0037)	(.0023)	
Netherlands	.0235	.0000	.0165	.0096	70.2
	(.0050)		(.0046)	(.0025)	
Portugal	.0345	.0000	.0414	.0130	120.0
	(.0106)		(.0146)	(.0032)	
Spain	.0230	.0000	.0230	.0093	100.0
	(.0048)		(.0057)	(.0026)	
Denmark	.0092	.0000	.0049	.0069	53.3
	(.0020)		(.0023)	(.0018)	
Sweden	.0298	.0000	.0262	.0087	87.9
	(.0073)		(.0066)	(.0022)	
UK	.0256	.0000	.0269	.0090	105.1
	(.0053)		(.0064)	(.0023)	

Standard errors from the bootstrapping procedure are presented in parentheses. All coefficients are highly significant, except for the cases indicated by *ns*.

over the period from 1973 to 1998 the nominal exchange rate flexibility was utilized to a lesser extent in countries like Austria and the Netherlands, where only 43%, respectively 70% of real exchange rate changes occur through nominal exchange rate movements.[13] At the other extreme are countries like Greece, Portugal and Spain, in which the response of the nominal exchange rate has even outpaced that of the real rate. The remaining countries can be placed in between. Considering the EU-15 countries which are not part of the EMU, the results indicate that in Denmark the adjustment to the common currency would have been comparable to that in Austria and the Netherlands. In the UK nominal exchange rate flexibility has been used much more often as an adjustment mechanism for permanent RER shocks. The adjustment to the common currency here would have been comparable to that in Spain and Portugal.

[13] In Ireland the calculated number of 70.2% is relatively small as well. However, this result is mainly due to the fact, that producer prices were used for this country. Therefore, the comparability is not granted for the case of Ireland and the results should be interpreted with caution.

TABLE 2.5: Long-term responses of real and nominal exchange rates in CEEC (1993-2006) and Cyprus and Malta (1973-2006) to permanent and transitory shocks

Country	Response of RER to a permanent shock (I)	Response of RER to a transitory shock (II)	Response of NER to a permanent shock (III)	Response of NER to a transitory shock (IV)	share of permanent shock to RER accounted for by NER (III)/(I)·100%
Czech Rep.	.0113	.0000	.0078	.0054	69.0
	(.0034)		(.0029)	(.0019)	
Hungary	.0133	.0000	.0184	.0095	138.3
	(.0035)		(.0065)	(.0035)	
Poland	.0228	.0000	.0221	.0318	96.9
	(.0054)		(.0124)	(.0157)	
Romania	.0306	.0000	$.0072^{ns}$	.0444	23.5
	(.0081)		(.0121)	(.0125)	
Slovakia	.0453	.0000	.0080	.0105	17.7
	(.0131)		(.0045)	(.0032)	
Slovenia	.0165	.0000	$.0000^{ns}$	.0058	0.0
	(.0052)		(.0231)	(.0013)	
Cyprus	.0173	.0000	.0129	.0052	74.6
	(.0035)		(.0029)	(.0009)	
Malta	.0087	.0000	$.0008^{ns}$	.0023	9.2
	(.0025)		(.0007)	(.0004)	

Standard errors from the bootstrapping procedure are presented in parentheses. All coefficients are highly significant, except for the cases indicated by ns.

Figure A3 and Table 2.5 present the results of the estimation with regard to the new EU member states with flexible exchange rate arrangements.[14] The responses of nominal and real exchange rates to transitory shocks have been similar to those in the EU-15. Concerning the response to permanent shocks, the results indicate that in Slovakia, Slovenia, and most notably Romania only a small amount of the real exchange rate adjustment has been brought about through nominal exchange rate changes. However, in Hungary and Poland, permanent shocks to the real exchange rate are carried out mainly by nominal exchange rate adjustments.

The examination of the nominal exchange rate as an adjustment mechanism reveals valuable insights about the behavior of the real exchange rate in some member states since the adoption of the Euro. Greece, Portugal and Spain, for instance, experienced a considerable real appreciation vis-a-vis Germany. In these countries

[14]Transition economies with fixed exchange rate arrangements have been excluded from the analysis since the methodology presupposes a minimum of exchange rate flexibility. However, as regards the utilization of the nominal exchange rate as an adjustment mechanism they can be classified as countries, in which the challenge of adaptation to the situation with common currency is not that pronounced, since they do not use the nominal rate flexibility at all.

the adaptation to the common currency has been especially challenging, since before 1999 they had extensively used nominal exchange rate flexibility as an adjustment mechanism. Moreover, depreciation had served to accomodate high inflation rates. It would have been better to allow for a more gradual adaptation to the common currency in these countries by a stepwise decrease of nominal exchange rate flexibility (if at all). This would have permitted adaptation of the process of expectation formation as well.

Further information contained in the SVAR estimates can be summarized using the variance decomposition of the forecast errors (FEVD). FEVD is a measure for the relative importance of the shocks under consideration to the system. Tables 2.6 and 2.7 report the relative contributions of permanent and transitory shocks to the real and nominal exchange rates. The left block of the tables reveals that even at short time horizons real exchange rate movements are mainly driven by permanent shocks. Only in Italy, the Netherlands, Romania, Slovakia and Czech Republic more than 25% of the forecast error variance at the one-month horizon is attributed to transitory shocks. Considering the right hand panel of the tables showing the relative contribution of permanent shocks to the nominal exchange rate, the results confirm by and large the outcome of the impulse-response functions. Especially in Denmark and the Netherlands the nominal exchange rate is mainly driven by transitory factors. However, in other countries like Finland, Greece, Portugal and Spain over 70% of the nominal exchange rate movements are due to permanent adjustments. In CEEC the nominal rate flexibility seems to be of great importance especially for Hungary and Poland, where the relative contribution of permanent shocks to the nominal exchange rate amounts to 91% and 69% respectively.

The parameters of the estimated SVAR equations can be further used to approximate the share of RER variance caused by transitory and permanent shocks. In the next step the structural shocks have been calculated from the disturbances in the two SVAR equations. The transitory shocks have been replaced by zero and

TABLE 2.6: Forecast error variance decomposition of real and nominal exchange rates in EU-15 (1973-1998)

Country	Relative contribution of permanent shocks to RER (in %)			Relative contribution of permanent shocks to NER (in %)		
	$k = 1$	$k = 12$	$k = 60$	$k = 1$	$k = 12$	$k = 60$
	(1)	(2)	(3)	(4)	(5)	(6)
Austria	93	90	88	55	54	55
Belgium	86	81	79	45	45	44
Finland	94	89	88	75	74	73
France	94	87	85	74	71	70
Greece	99	96	95	78	74	74
Ireland	91	86	86	49	50	50
Italy	72	71	71	46	47	49
Luxembourg	100	93	93	87	83	82
Netherlands	71	71	70	27	28	29
Portugal	94	90	89	86	83	83
Spain	95	94	91	75	75	74
Denmark	86	83	81	24	25	26
Sweden	93	88	88	69	68	67
UK	85	80	81	65	66	65

TABLE 2.7: Forecast error variance decomposition of real and nominal exchange rates in CEEC (1993-2006) and Cyprus and Malta (1973-2006)

Country	Relative contribution of permanent shocks to RER (in %)			Relative contribution of permanent shocks to NER (in %)		
	$k = 1$	$k = 12$	$k = 60$	$k = 1$	$k = 12$	$k = 60$
	(1)	(2)	(3)	(4)	(5)	(6)
Czech Rep.	63	56	56	26	26	28
Hungary	100	96	90	94	93	91
Poland	87	86	83	70	70	69
Romania	63	60	60	16	17	21
Slovakia	72	70	70	34	37	39
Slovenia	99	95	95	0	2	5
Cyprus	100	98	97	61	60	60
Malta	85	76	76	7	9	10

the new time series containing the permanent shocks and the zeroed-out transitory shocks, $\hat{u}_t$, have been used to achieve the movements of the real exchange rate that are caused solely by permanent shocks.

The variance of the real exchange rate driven by permanent shocks in absence of transitory shocks is shown in Table 2.8. The results indicate that there is a range of countries where the variance of real exchange rates vis-a-vis Germany driven by permanent shocks has been relatively low. The calculated values show that a monetary union between Germany on the one hand and Austria, Belgium, France, Luxembourg, Netherlands and most notably Denmark would be a more dsirable

TABLE 2.8: Variance of RER due to permanent shocks in EU-15, Cyprus and Malta (1973-1998) and CEEC (1993-2006)

Country	Variance due to perm. shocks
Austria	44.4
Belgium	45.2
Finland	199.3
France	44.5
Greece	134.1
Ireland	73.1
Italy	154.4
Luxembourg	49.0
Netherlands	24.7
Portugal	269.8
Spain	146.8
Denmark	24.6
Sweden	138.1
UK	180.4
Czech Rep.	647.1
Hungary	344.7
Poland	425.6
Romania	2205.2
Slovakia	1150.0
Slovenia	40.6
Cyprus	91.5
Malta	259.3

currency area than with the other countries.[15] On the other hand, the inclusion of countries like Greece, Portugal, Spain, Italy and Finland is associated with increasing costs of monetary unification. Among the new member states Slovenia exhibits variance comparable to Austria and Belgium and can therefore be considered an adequate member of the currency area. The variance in the remaining CEEC is extremely high, even in Slovakia, where the Euro has already been introduced as official currency. The accession of these countries is less desirable as long as they are in need of large real exchange rate adjustment.

Figure 2.1 combines the results of the variance analysis and the impulse response functions. Several groups of countries can be identified. The first group includes Austria, Belgium, Denmark, France, Luxembourg, the Netherlands and Slovenia. In these countries the nominal exchange rate has been used as an adjustment mechanism for permanent shocks to the real exchange rate, but the need for real

[15]The value for Ireland is relatively low too. However, this is again due to the fact that consumer prices were not available for this country and producer prices were used instead. Therefore, the result is not really comparable to the others.

exchange rate adjustment vis-a-vis Germany has been relatively low. These countries would form a desirable monetary union with Germany. The second group consists of Greece, Finland, Italy, Portugal, Spain, and probably Cyprus, where the need for real exchange rate adjustment has been pronounced and the nominal exchange rate has been used as valuable adjustment mechanism. These countries are less suitable to form a desirable currency area with Germany, and it is not surprising that most of them faced considerable difficulties in the last years including loss of competitiveness. The third group includes the Czech Republic, Hungary and Poland. These countries use the exchange rate flexibility, and they should do so in the future since the need for permanent real exchange rate adjustment with respect to Germany is very high there. According to the real exchange rate criterion they should not join the monetary union, at least not in the near future. The last group includes countries, where the nominal exchange rate has not been extensively used as an adjustment mechanism, but the permanent component of the RER variance has been high to very high. This group includes Malta, Romania and Slovakia. These countries are in need of real exchange rate adjustments and do not form a desirable monetary union with Germany. They would benefit from having and using flexible exchange rates vis-a-vis Germany as an adjustment mechanism.[16]

[16]This group can be reasonably extended by the countries excluded from the analysis due to lacking nominal exchange rate flexibility, Bulgaria and the Baltic states. They do not use the nominal exchange rate as an adjustment mechanism. However the real appreciation in the last decades does not allow them to form a desirable monetary union with Germany.

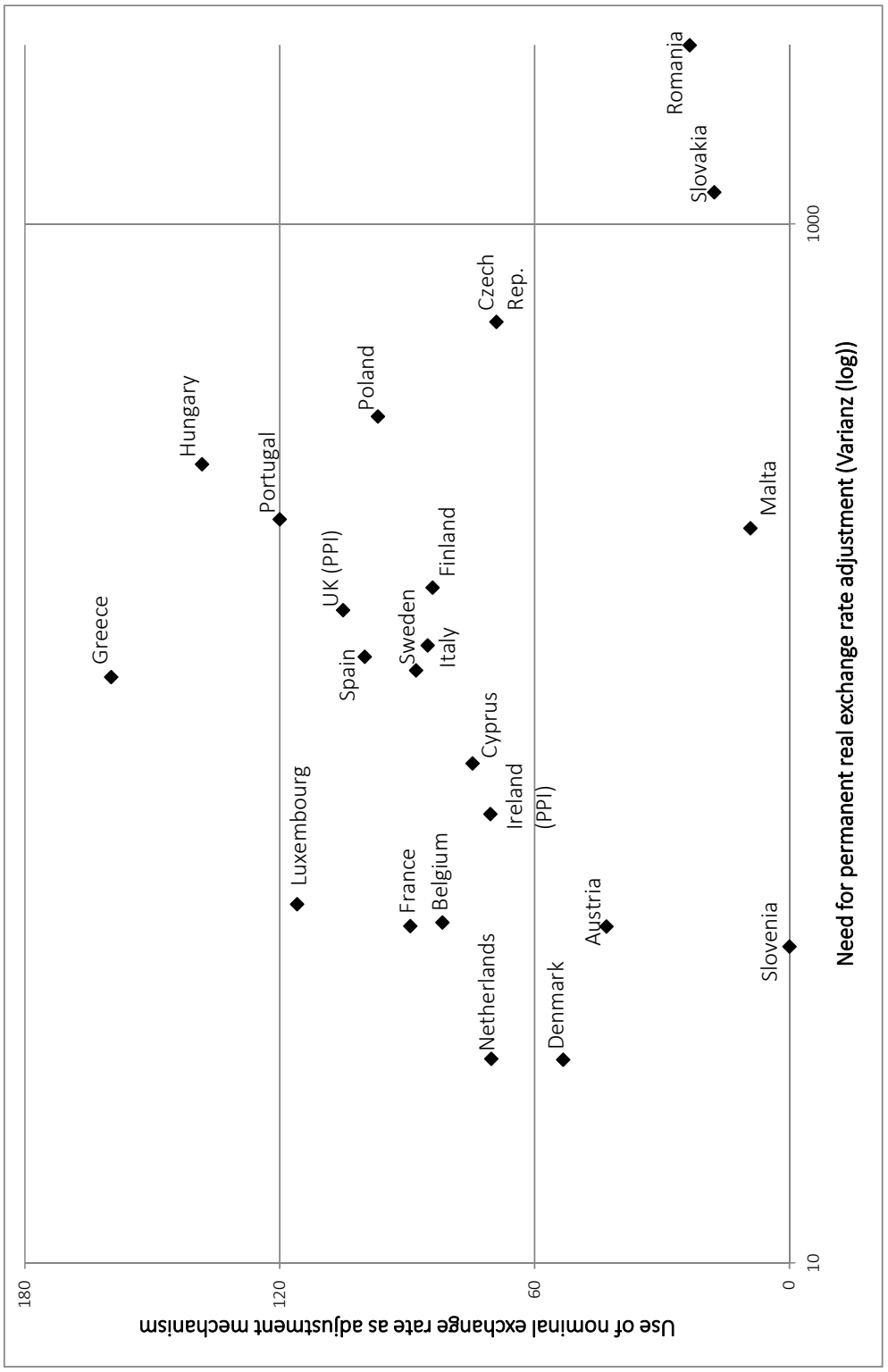


FIGURE 2.1: Classification of EU member states due to the real exchange rate criterion

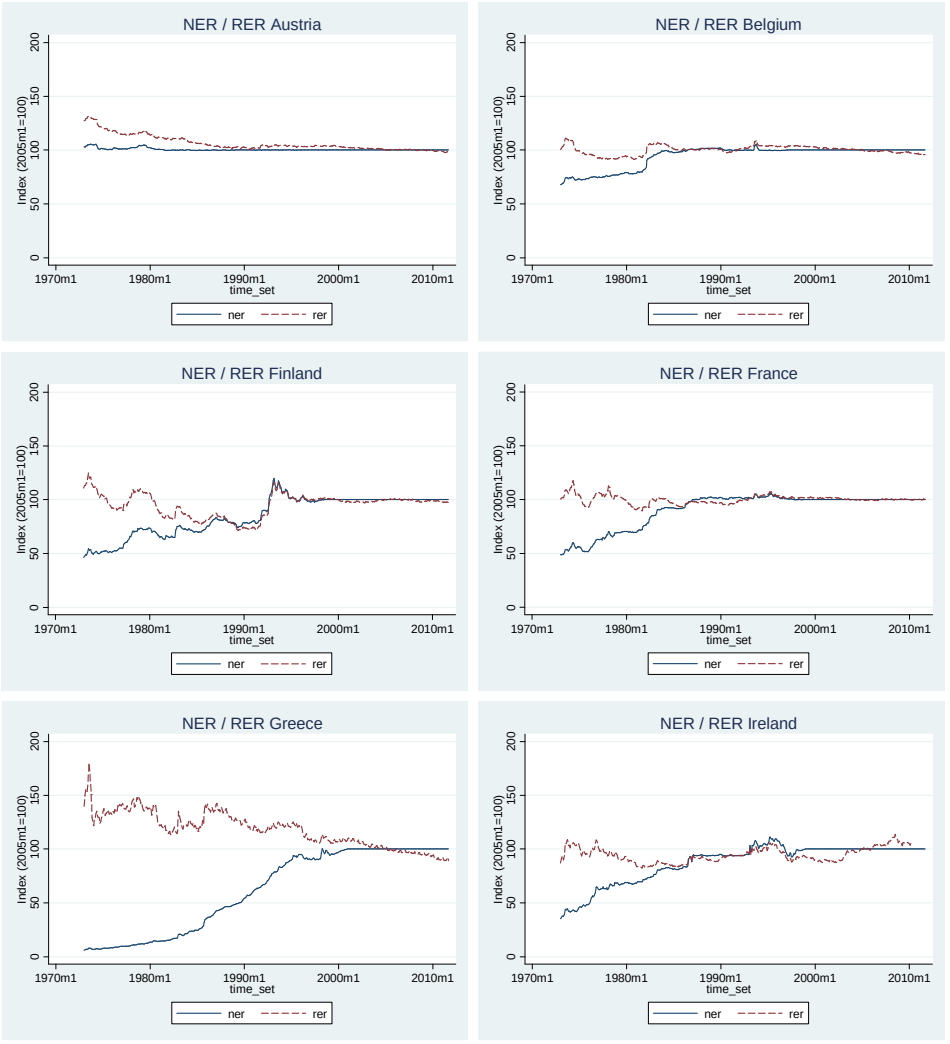
2.5 Concluding remarks

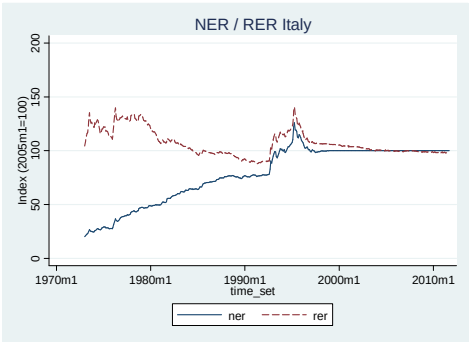
This chapter has examined the dynamics and sources of real and nominal exchange rate changes in EU countries prior to their accession to the monetary union. In the first place, the real exchange rate persistence turned out to vary widely among EU countries, indicating that RER shocks, as well as the adjustment path of the real exchange rate, differ accross member states. In the second part of the analysis, an attempt was made to decompose the variance of nominal and real exchange rates. The results indicate that real exchange rates are driven mainly by permanent shocks and these have been carried out through nominal exchange rate changes, especially in countries like Hungary, Poland, Finland, Greece, Portugal and Spain. Reappraising the real exchange rate criterion proposed by Vaubel (1976, 1978), this outcome implies that these countries benefit, or would have benefited, from retaining nominal exchange rate flexibility. Austria, Belgium, Denmark, France, Luxembourg, the Netherlands and Slovenia, on the other hand, are more likely to fulfill the real exchange rate criterion and could thus form a more desirable monetary union with Germany.

These results are relevant not only as regards the future accession of CEEC to the monetary union. Moreover, they indicate that a possible way out of the currency union would be less costly for current member states like Greece, Portugal and Spain, since they will regain the nominal exchange rate flexibility, which they have extensively used before the Euro introduction.

Appendix

Figure A2.1: Nominal and real exchange rates of EU member states vis-a-vis Germany (Attention should be paid to the different scaling in the case of CEEC, especially in the case of Lithuania.)




NER / RER Italy
Index (2005m1=100)
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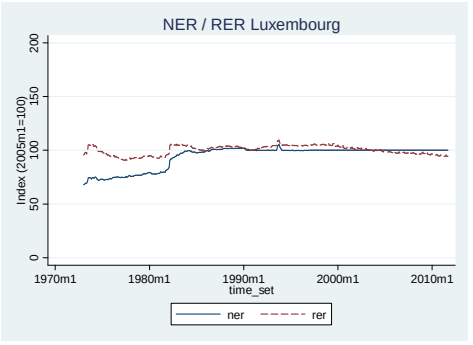
rer


NER / RER Luxembourg
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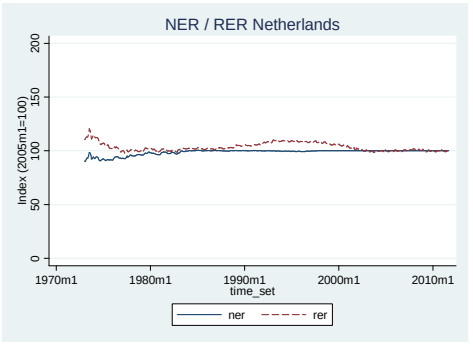
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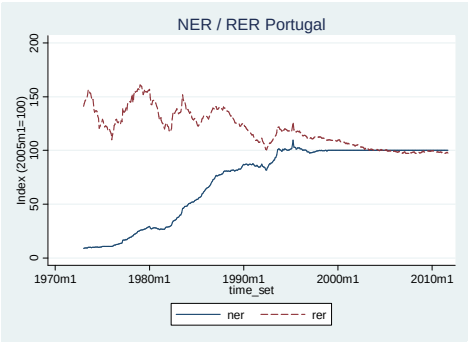
NER / RER Portugal
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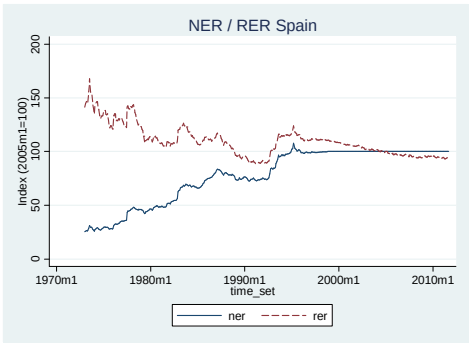
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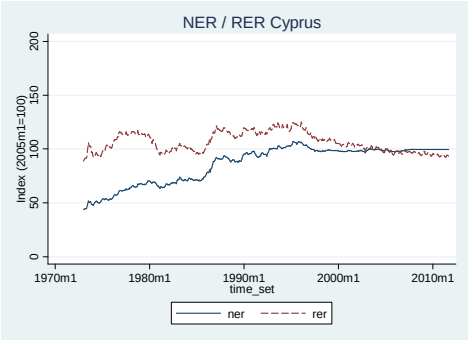
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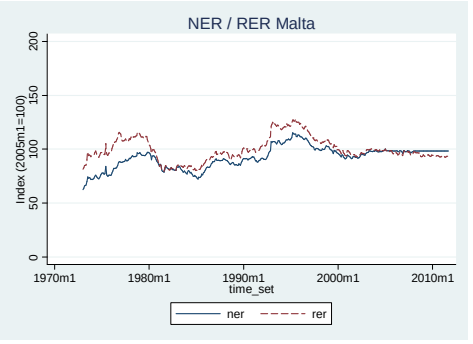
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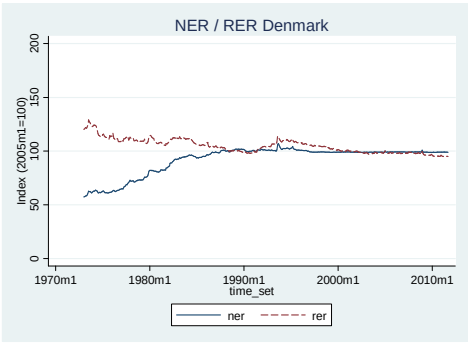
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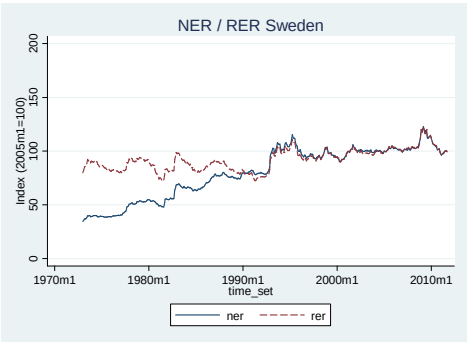
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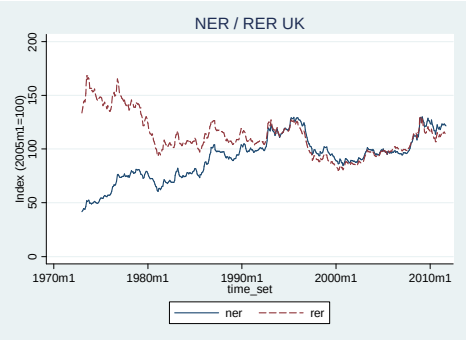
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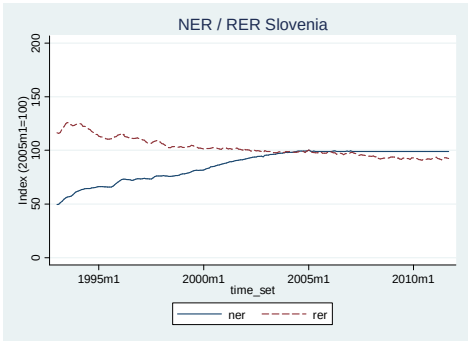
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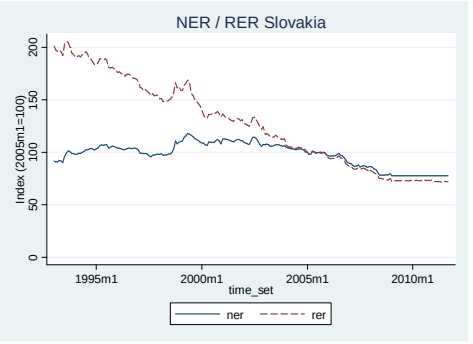
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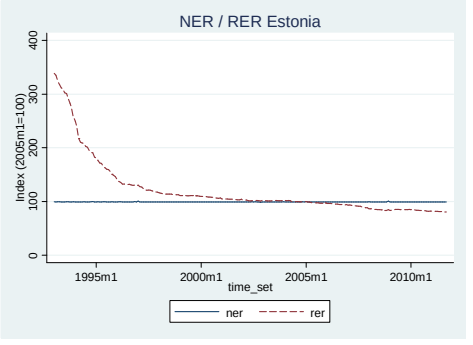
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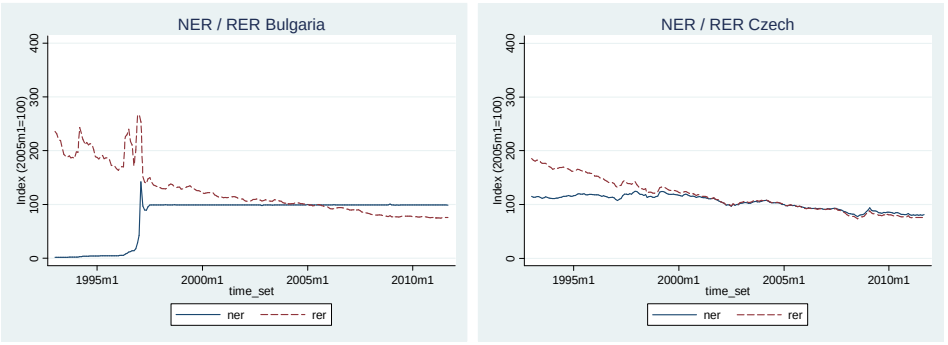
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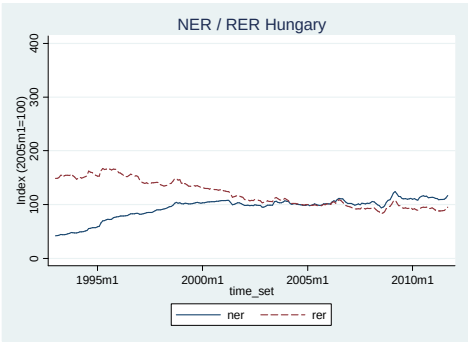
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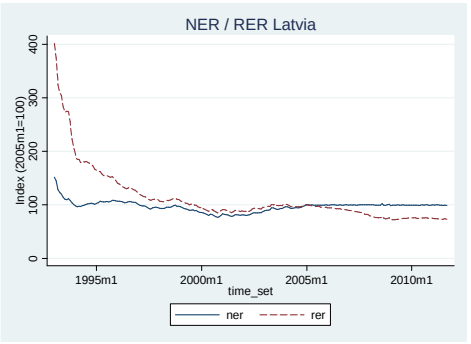
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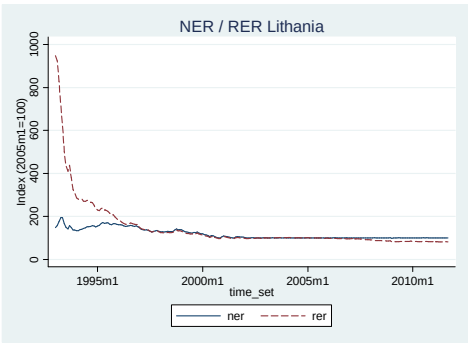
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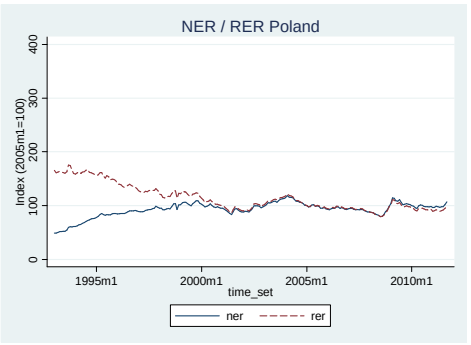
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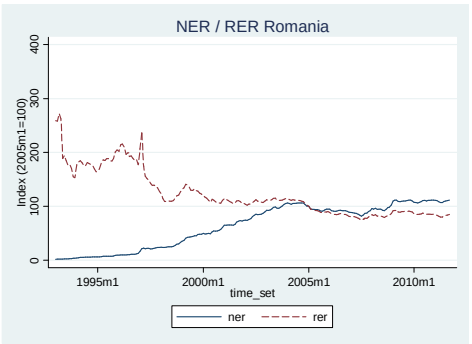
NER / RER Romania
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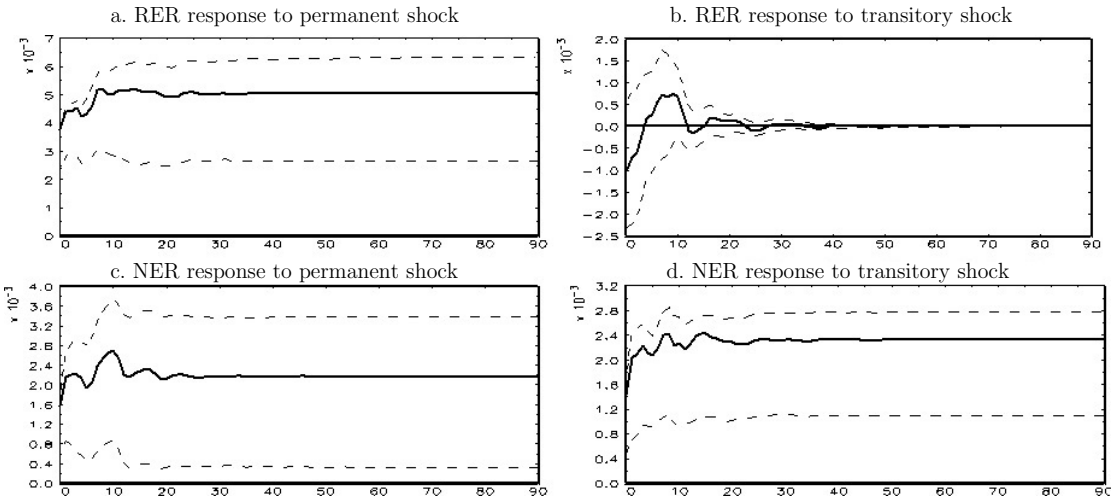
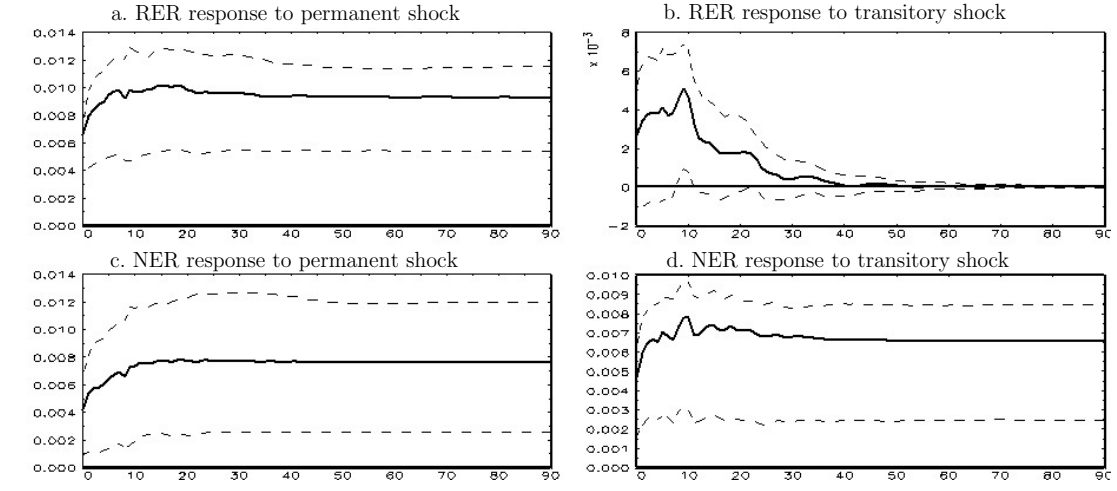
Figure A2: Dynamic responses of real and nominal exchange rates in EU-15 to permanent and transitory shocks (1973-1998)

A. Austria

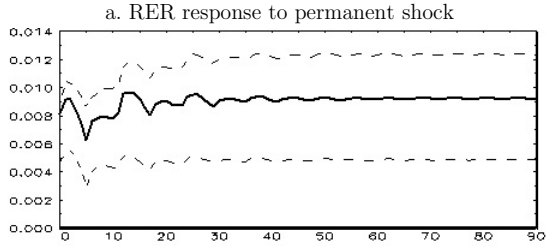


B. Belgium

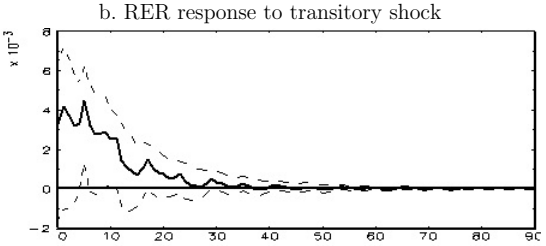


C. Denmark

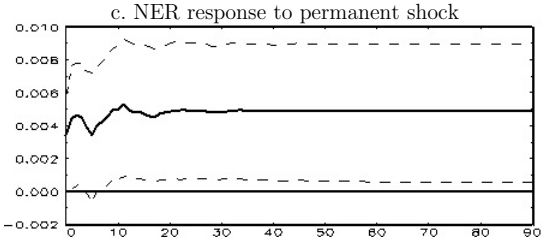
a. RER response to permanent shock



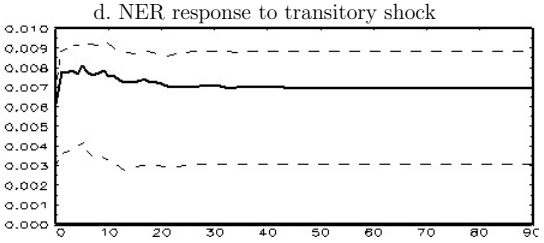
b. RER response to transitory shock



c. NER response to permanent shock

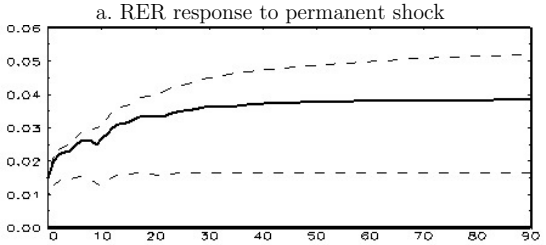


d. NER response to transitory shock

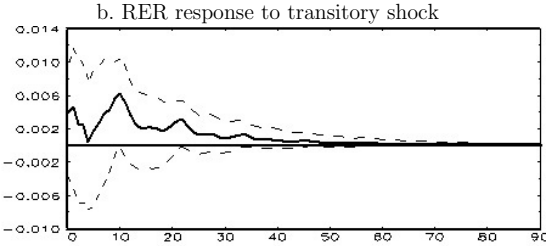


D. Finland

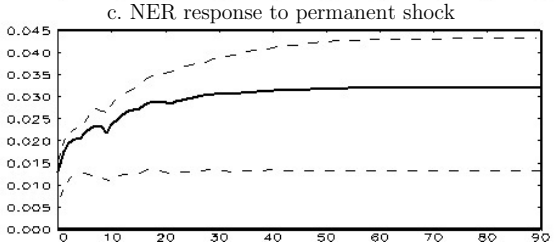
a. RER response to permanent shock



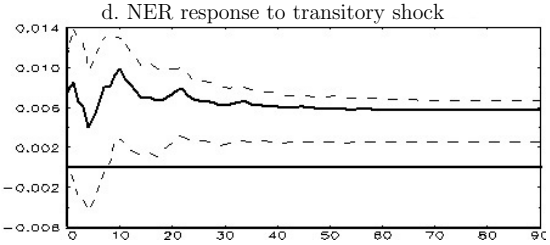
b. RER response to transitory shock



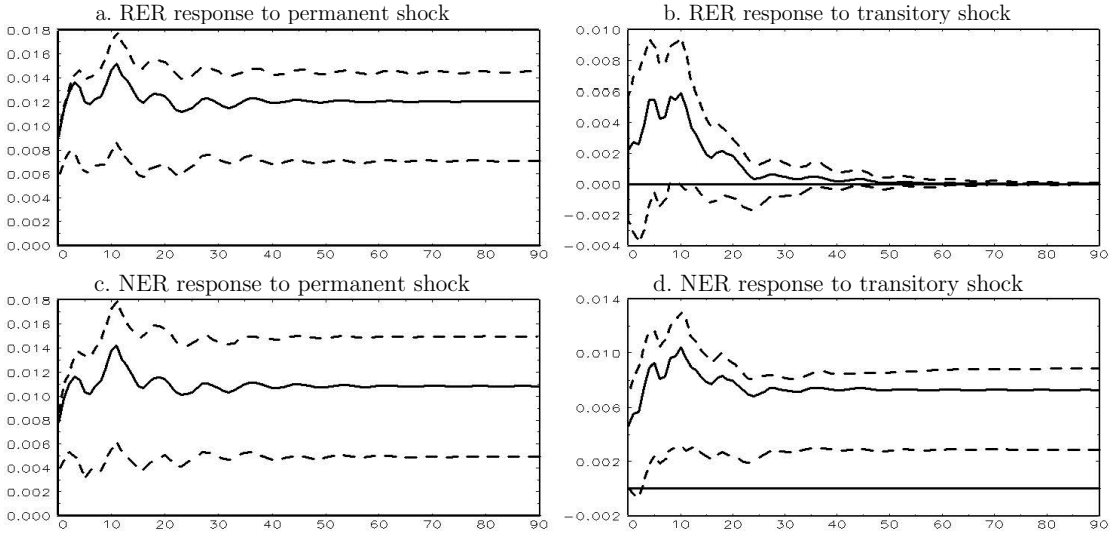
c. NER response to permanent shock



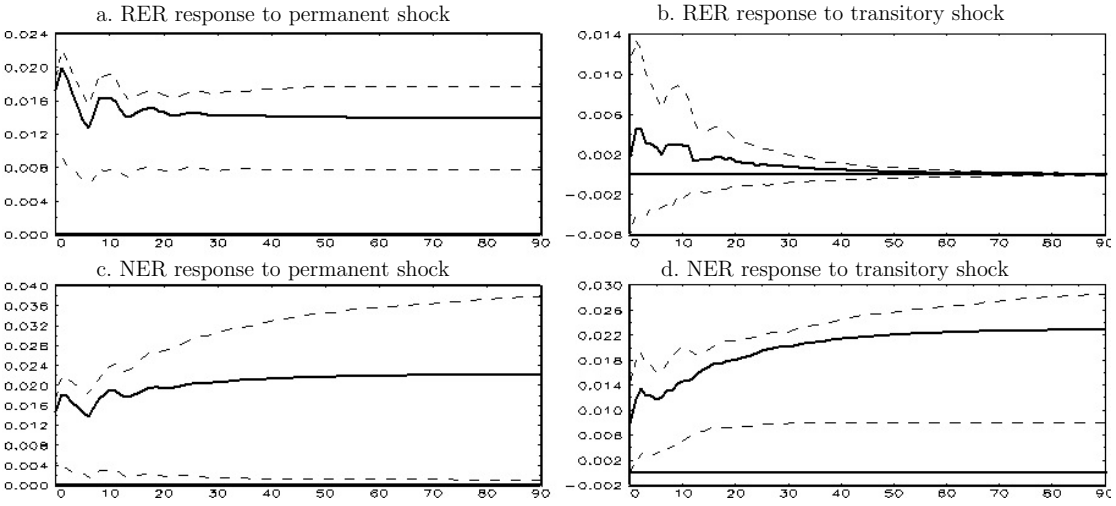
d. NER response to transitory shock



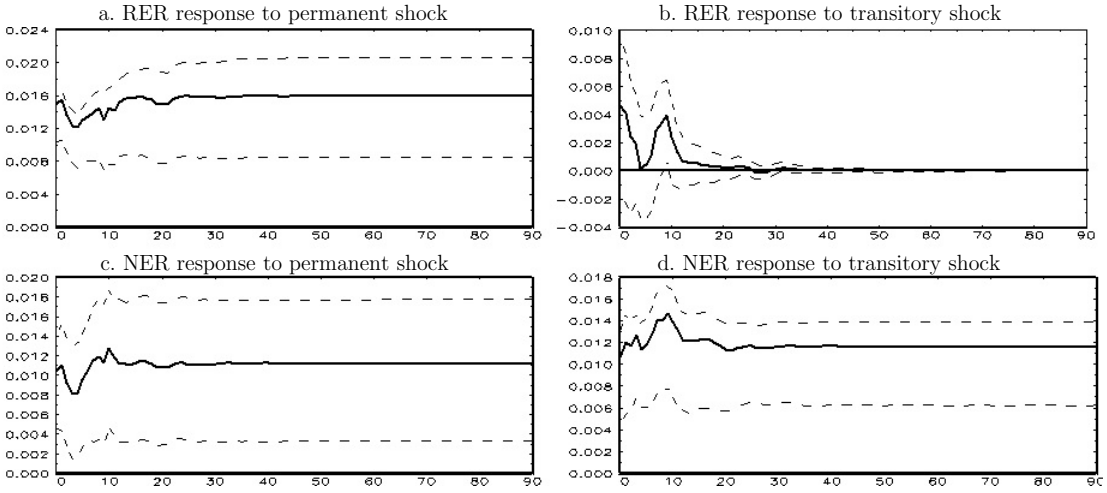
E. France



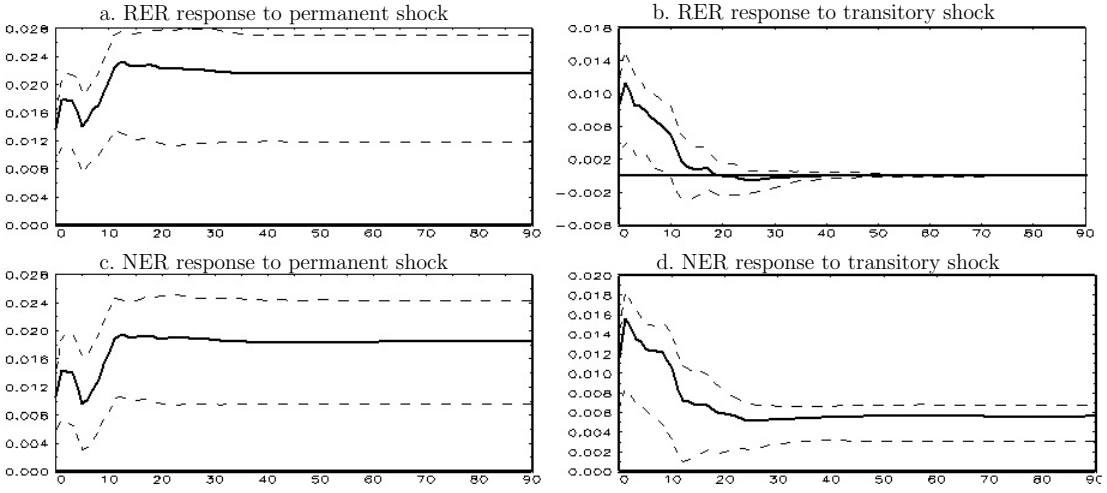
F. Greece



G. Ireland

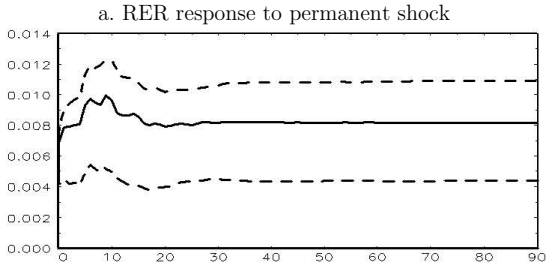


H. Italy

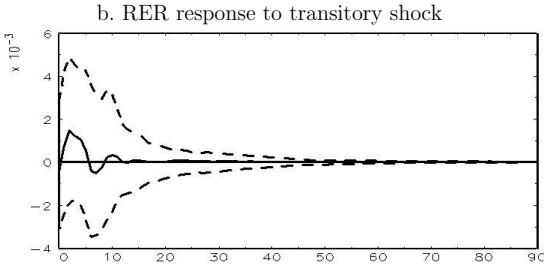


I. Luxembourg

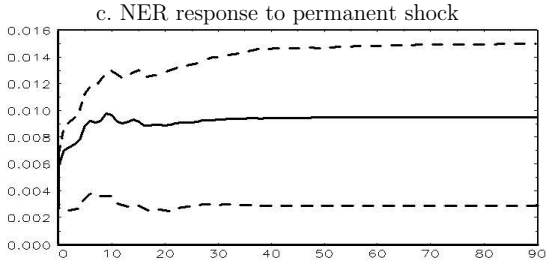
a. RER response to permanent shock



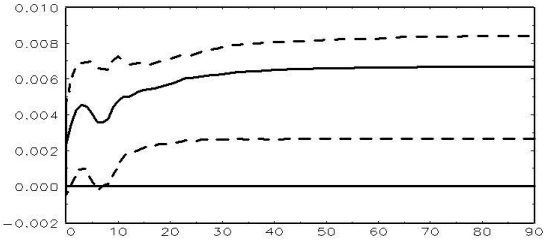
b. RER response to transitory shock



c. NER response to permanent shock

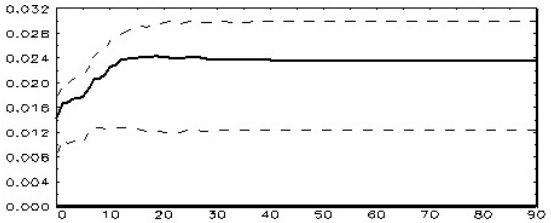


d. NER response to transitory shock

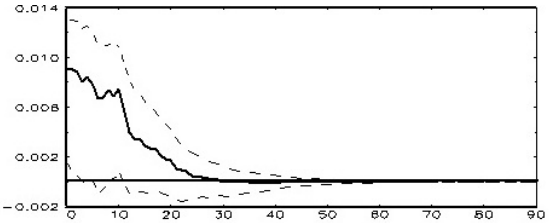


J. Netherlands

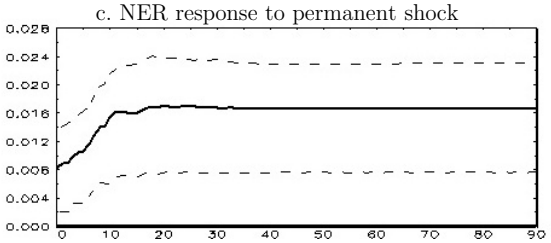
a. RER response to permanent shock



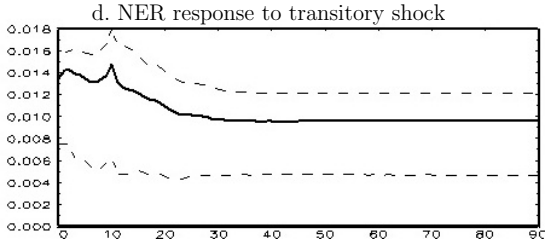
b. RER response to transitory shock



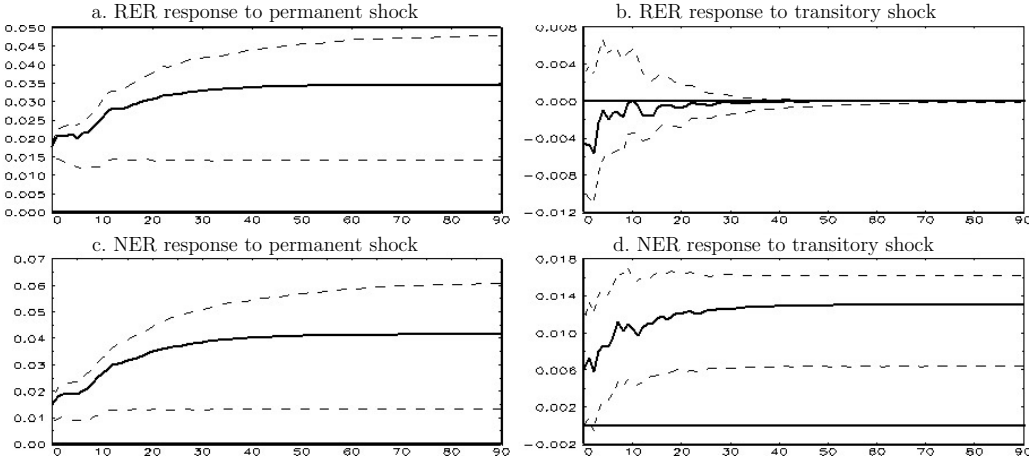
c. NER response to permanent shock



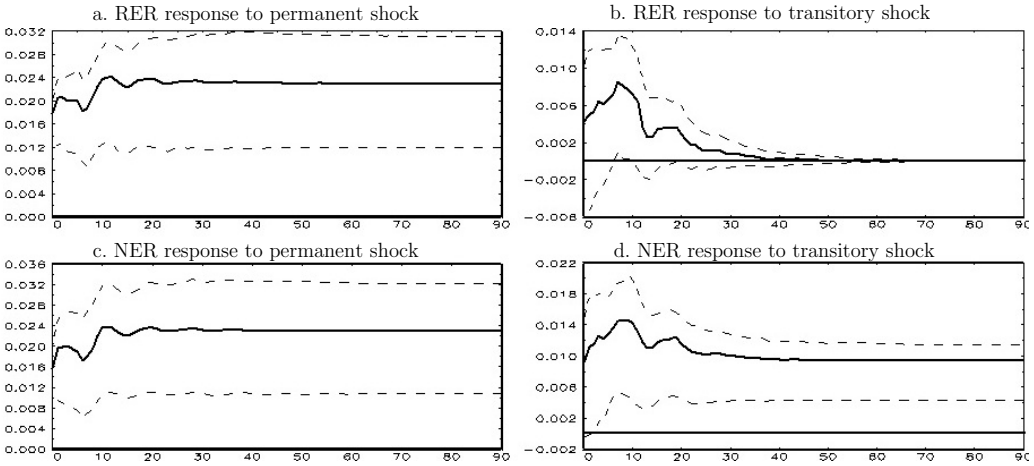
d. NER response to transitory shock



K. Portugal

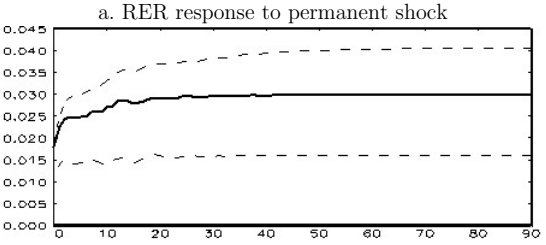


L. Spain

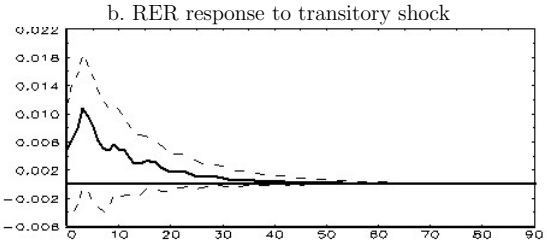


M. Sweden

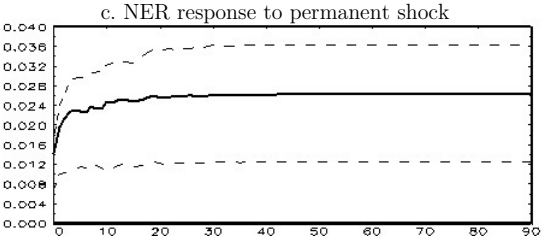
a. RER response to permanent shock



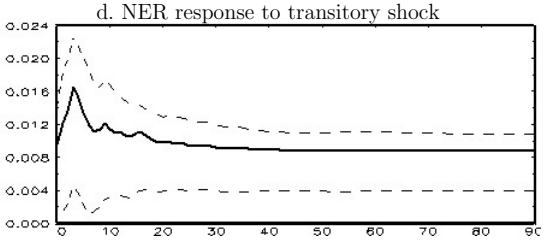
b. RER response to transitory shock



c. NER response to permanent shock

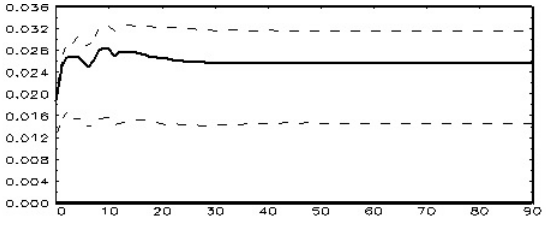


d. NER response to transitory shock

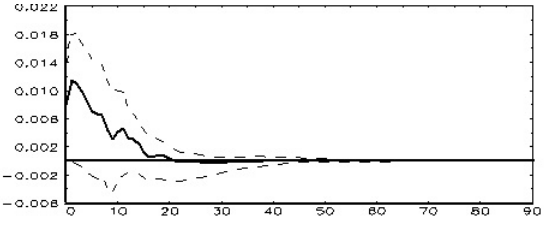


N. UK

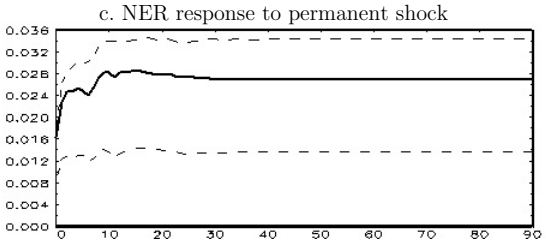
a. RER response to permanent shock



b. RER response to transitory shock



c. NER response to permanent shock



d. NER response to transitory shock

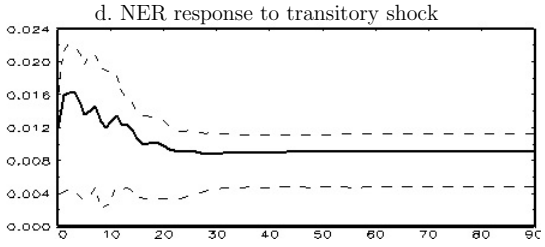
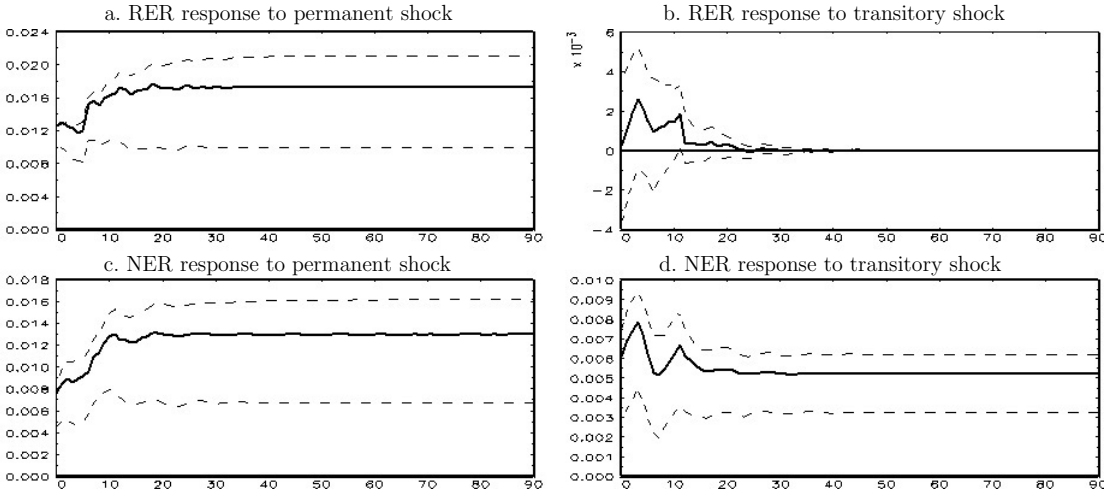
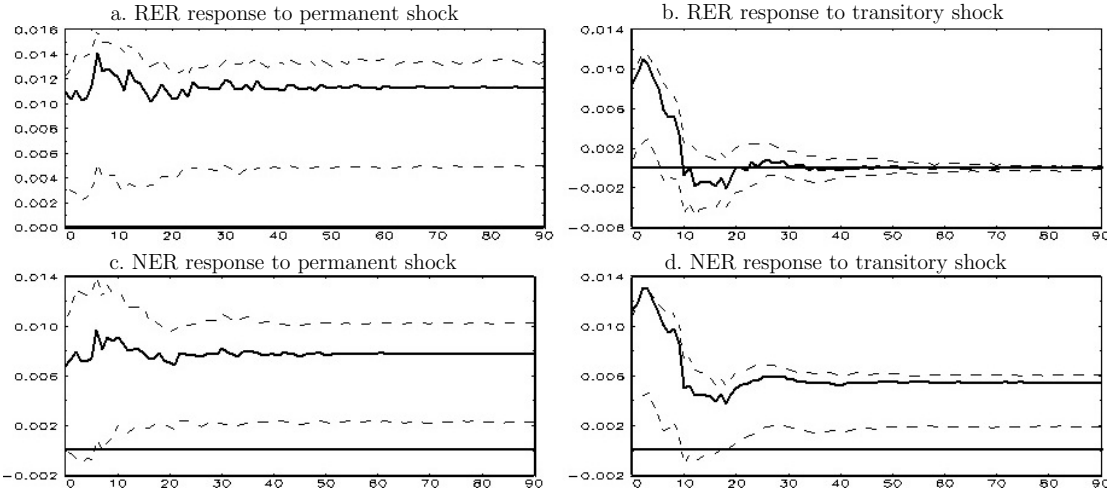


Figure A3: Dynamic responses of real and nominal exchange rates in the new EU member states to permanent and transitory shocks

A. Cyprus

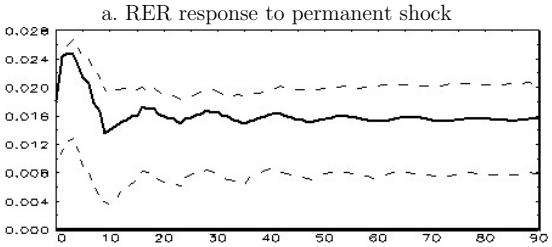


B. Czech Republic

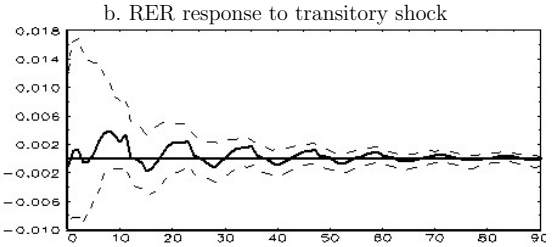


E. Hungary

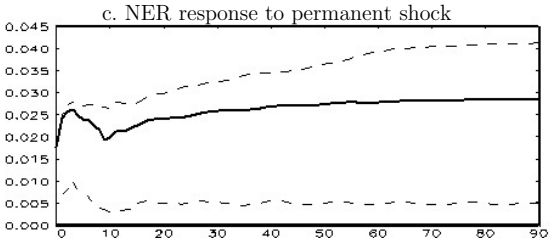
a. RER response to permanent shock



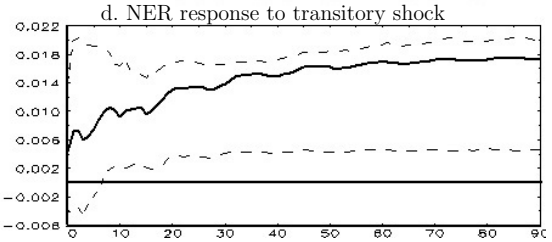
b. RER response to transitory shock



c. NER response to permanent shock

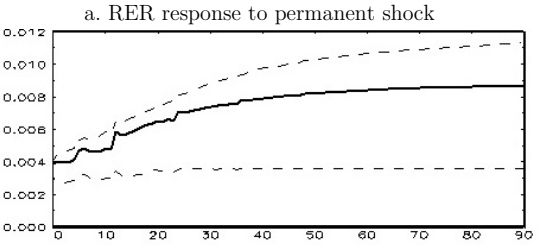


d. NER response to transitory shock

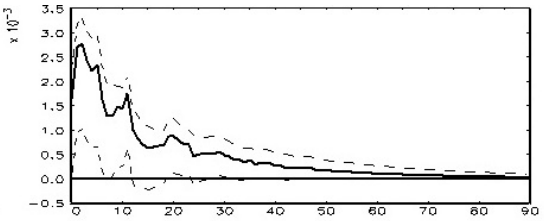


F. Malta

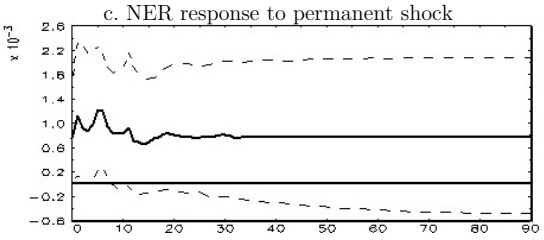
a. RER response to permanent shock



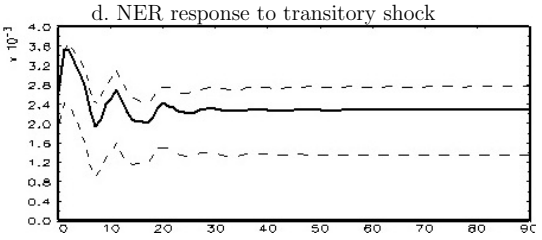
b. RER response to transitory shock



c. NER response to permanent shock

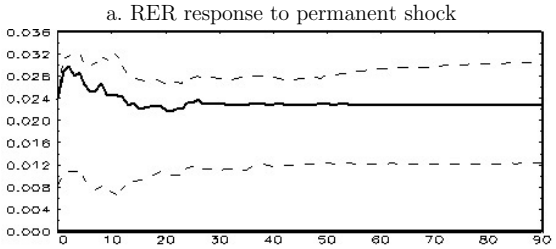


d. NER response to transitory shock

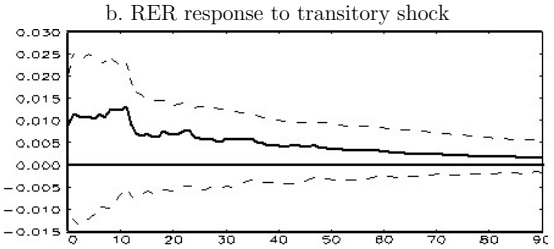


G. Poland

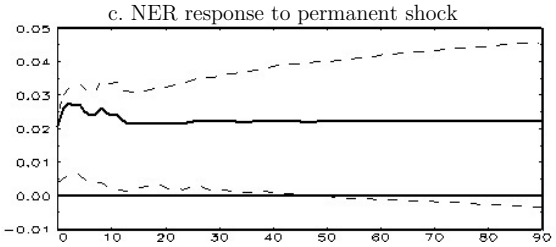
a. RER response to permanent shock



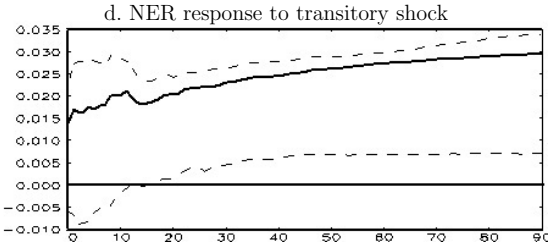
b. RER response to transitory shock



c. NER response to permanent shock

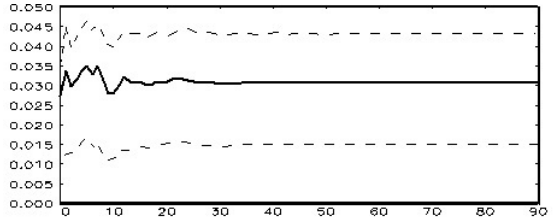


d. NER response to transitory shock

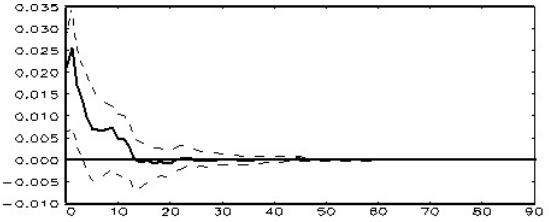


H. Romania

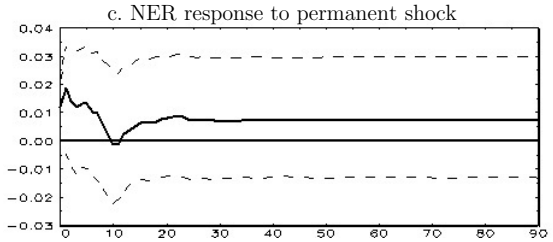
a. RER response to permanent shock



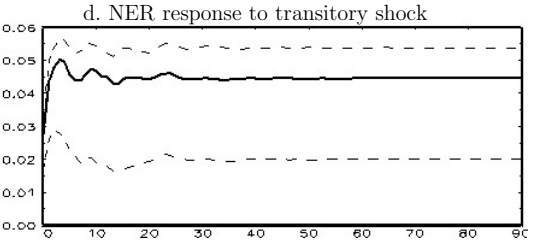
b. RER response to transitory shock



c. NER response to permanent shock



d. NER response to transitory shock



Chapter 3

Explanations for the real appreciation in the New EU Member States in Transition[1]

3.1 Introduction

Almost 25 years of transition have brought about significant change in the structure of Central and Eastern European countries (CEEC). According to the latest report of the European Bank for Reconstruction and Development (EBRD), many of these countries have almost finished the transition process to market economy.[2] The 2012 report points out that the new EU member states from Central and Eastern Europe who joined the European Union in 2004 and 2007 have already achieved an encouraging average of above 3.6 points of the transition indicators with 4.3 being the score for the advanced industrialized countries (EBRD 2012). After the

[1]The first draft of this chapter was written while I was a visiting researcher at the Bulgarian National Bank (BNB). I am indebted to Grigor Stoevski, Emilia Penkova and Slavi Slavov for their detailed feedback on the preliminary version. I would like to also thank Alexandru Minea, Nikolay Nenovsky, Kalina Dimitrova, Andrey Vasilev, Rosen Rozenov, Svilen Pachedjiev, as well as all the staff at the department of Mariela Nenova and the participants in the BNB seminar for helpful comments and suggestions. Furthermore, my best thanks go to Stoyan Bozhkov and Tzvetomir Tzanov for their friendly support during my stay at the BNB. Although my stay at the BNB was financially backed by the visiting researcher program, the views expressed in the chapter are my own and do not necessarily reflect the official views of the BNB. All remaining errors are mine.

[2]The present chapter covers ten countries in transition, namely those who joined the European Union in 2004 and 2007 because they can be considered a homogeneous group sharing similar characteristics and the common target of joining the European Economic and Monetary Union (EMU).

accession to the European Union, the next step which these countries may take is the adoption of the Euro. Slovenia was the first to introduce the European currency at the beginning of 2007 and was followed by Slovakia in 2009, Estonia in 2011 and Latvia in 2014. The remaining six countries are expected to join the system in the near future. However the fulfillment of the Maastricht criteria is often considered a hard task for the CEEC because the strong real appreciation as a result of the real convergence process and further transition specific changes since the breakdown of the COMECON[3] makes the simultaneous achievement of low inflation and nominal exchange rate stability very difficult. Furthermore, the trend appreciation of the real exchange rate makes the Euro adoption by these countries less desirable.[4]

The development of the real exchange rate (RER) is one of the "diagnostic" characteristics of the transition period (Fischer 2002) and is often seen as an indicator for the potential loss of competitiveness in the export sector (see e.g. Oomes 2005).[5] The collapse of the Communist system was accompanied by sharp nominal and real depreciation of the currencies of Central and Eastern Europe. To a large extent the depreciation was a result of the monetary overhang at the beginning of the transition process. However, the political and economic uncertainty explains the fact that the CEEC began the transition not only with depreciation but also with strongly "undervalued" currencies, as has often been claimed in the analyses of RER development in CEEC (Halpern/Wyplosz 1997, Krajnyak/Zettelmeyer 1998).[6] [7] The real appreciation that followed was initially considered as a correction to the sharp depreciation. However, the real exchange rate continued to appreciate long after the initial level had been re-attained. The real appreciation turned out to be a phenomenon characterizing the transition process.

[3]Council for Mutual Economic Assistance.

[4]See Chapter 2 of the present thesis.

[5]Real appreciation does not necessarily imply loss of competitiveness, though. In order to evaluate the effect of real appreciation on competitiveness, the driving forces of the real exchange rate need to be examined. See below.

[6]The real exchange rate at the beginning of the transition process was often considered "undervalued". The usage of this term affords the knowledge of the equilibrium real exchange rate, though. Since there is no consensus in the literature about the calculation of equilibrium values for the real exchange rate, the term "undervalued" should be taken with caution.

[7]The explanation proposed by Halpern and Wyplosz (1997) is based on the lack of confidence in the untested authorities. Uncertainties surrounding the equilibrium value of the exchange rate at the beginning of transition made policymakers prefer to err rather on the side of "undervaluation".

Figure 3.1 plots the development of the real effective exchange rate of CEEC against their 42 main trading partners. The consumer price deflated index is expressed relative to the base year 2005 with decreasing values indicating real appreciation. The magnitude of the real exchange rate appreciation differs across countries. Nevertheless, it is a common phenomenon in these countries on their way through the process of transition. Real appreciation was especially high in the first years of transition and has slowed down during the recent economic crisis. The most pronounced real exchange rate appreciation was observed in Lithuania, followed by Estonia and Bulgaria. In Slovenia, on the contrary, the pace of real exchange rate development has been rather modest, especially in recent years.

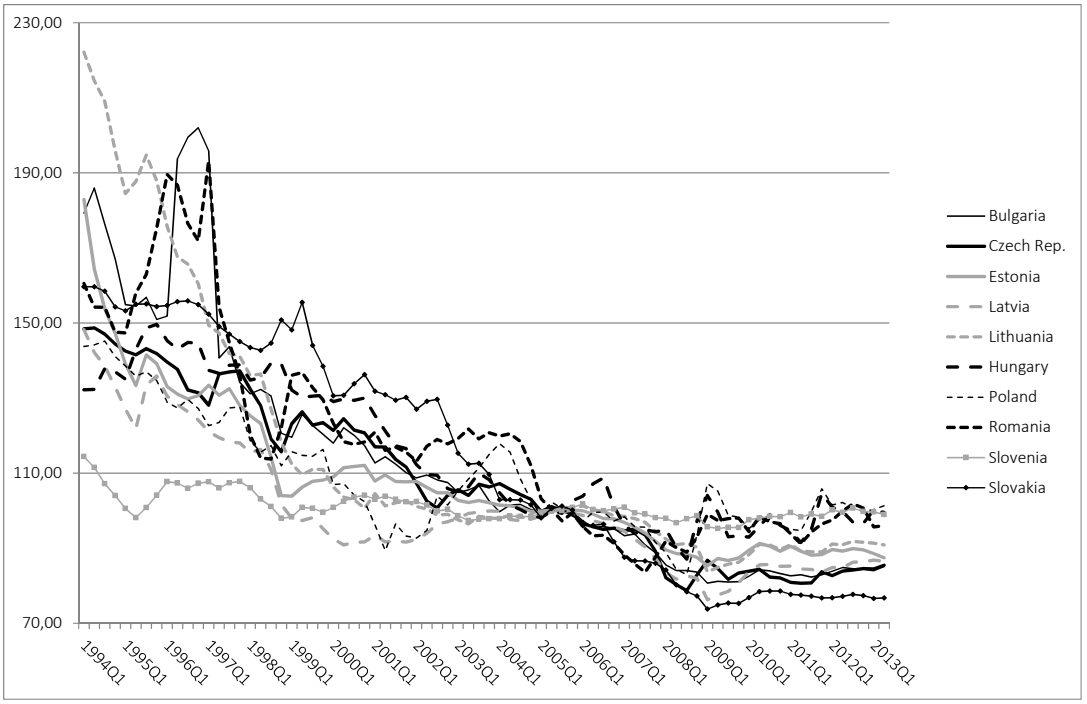


FIGURE 3.1: Real effective exchange rates in CEEC

Source: Own calculations based on data from Eurostat; 2005=100; Consumer price deflated against 42 main trading partners; Decreasing values indicate real appreciation.

The observed development of real exchange rates in transition economies led to a large body of literature. Many approaches were proposed to explain the CEEC real appreciation. Some authors refer to productivity developments as in the Balassa-Samuelson framework focusing on the supply side of the economies (e.g. Golinelli/Orsi 2002, Jazbec 2002, Rother 2000, Sinn/Reutter 2001). Others claim that the productivity differentials account only for a small part of the real appreciation and search for further determinants in other macroeconomic variables such

as demand side factors (Coricelli/Jazbec 2004) and shifts of production toward new goods or goods of better quality (Backé et al. 2003, Égert 2004, Égert et al. 2003, Mihaljek/Klau 2003). The present chapter offers a comprehensive analysis of the driving forces of the real exchange rate in CEEC in the process of transition. Potential explanations for the development of the RER are discussed and empirically tested whereas the RER is decomposed in two components - the real exchange rate of the tradables sector of the economy and the price of tradable goods in terms of nontradables relative to a reference country.

The contribution of the present analysis to the discussion about explanations for the real appreciation is threefold. First, in-depth analysis of the development of consumer prices should shed light on the main categories of goods and services which have promoted real appreciation in transition economies. Second, the tradables/nontradables dichotomy is examined with regard to the countries of Central and Eastern Europe using the degree of openness of the main industries as an indicator. A more precise distinction between tradables and nontradables should facilitate the investigation of potential driving sources of real appreciation, like e.g. the Balassa-Samuelson effect. And third, detailed analysis of private consumption demand including the calculation of income elasticity contributes to the examination of consumption-driven real appreciation as proposed by Bergstrand (1991).

The results partly differ from the existing body of literature exploring the real exchange rate movements in the transition countries. The presence of productivity driven real appreciation as proposed by Balassa (1964) and Samuelson (1964) is confirmed by and large. The elasticity of the overall real exchange rate responses to productivity of tradables relative to nontradables lies between -0.25 and -0.56. Furthermore, a range of demand side variables has affected the development of real exchange rates in CEEC. The effect of the shift in private consumption is different from the one described in the literature thus far.[8] The present analysis points out that private consumption has indeed shifted toward luxury goods. However, luxury goods are mostly tradables in CEEC as opposed to the assumption made by Bergstrand (1991). Shifts of private consumption have led to increasing prices of tradable goods and services relative to abroad. The empirical analysis further shows that the effect of increasing investment demand on the real exchange rate has weakened the real appreciation, since growing investment demand leads to

[8]See e.g. Bergstrand (1991), Coricelli and Jazbec (2004).

real depreciation. The progress in transition has affected the real exchange rate as well: increasing private sector share and decreasing share of administered prices are associated with real depreciation.

The rest of this chapter is organized as follows. Section 3.2 reconsiders the theoretical explanations for the real appreciation in the CEEC. In Section 3.3, disaggregated consumer prices are used to identify categories of goods and services most affected by the real appreciation. Section 3.4 investigates tradability in different industries and presents the main results of the empirical analysis. Finally, Section 3.5 contains some concluding remarks.

3.2 Theoretical background

The real exchange rate is defined as the price of a foreign commodity bundle in terms of domestic commodity bundles:

$$Q = E \cdot \frac{P^*}{P}, \tag{3.1}$$

or respectively

$$q = e + p^* - p \tag{3.2}$$

expressed in logarithms. E refers to the nominal exchange rate as the price of foreign currency in terms of home currency. P represents the overall price level; asterisks denote variables for the foreign country and small letters represent the corresponding variables in logarithms. An increase in the real exchange rate therefore indicates a real depreciation of the home currency.

The price level in each country can be calculated as the geometric average of the price level in the tradables (T) and nontradables (N) sector:

$$p = \alpha p^T + (1 - \alpha) p^N \tag{3.3}$$

$$p^* = \alpha^* p^{T*} + (1 - \alpha^*) p^{N*}, \tag{3.4}$$

where α denotes the weight of tradable goods in the price index and is calculated as the share of tradables in the overall consumption expenditure. $(1 - \alpha)$ is respectively the share of nontradables.

Substituting equations (3.3) and (3.4) into equation (3.2) and rearranging leads to the following equation:

$$q = [e + p^{T*} - p^T] + [(1 - \alpha)(p^T - p^N) - (1 - \alpha^*)(p^{T*} - p^{N*})] \tag{3.5}$$

The first term in parentheses is the real exchange rate calculated merely with prices for tradable goods, thus the real exchange rate in the tradables sector.[9] It will be denoted q^T. According to relative Purchasing Power Parity (PPP) it should be constant over time or at least revert to a constant mean value, since tradable goods are exposed to international competition.[10] The second term is the price of tradable goods in terms of nontradables relative to that in the foreign country, respectively weighted by the share of nontradables in overall consumption expenditures. It can be thought of as the real exchange rate of the sheltered sector and will be labeled q^N. Decreasing relative prices of tradables to nontradables at home relative to abroad lead ceteris paribus to a real appreciation. This effect can be strengthened by an increasing share of nontradables in the overall consumption in the home relative to the foreign country. Based on equation (3.5), an appreciation of the real exchange rate is thus formed by the combined effect of the real appreciation in the sector of tradable goods and the increase in the price of nontradables in terms of tradables relative to the foreign country, again weighted by the share of nontradables in consumption:

$$\hat{q} = \hat{q}^T + \hat{q}^N. \tag{3.6}$$

A hat indicates that the corresponding variables are expressed as growth rates. Equations (3.5) and (3.6) represent the basis for further discussion.

[9] See e.g. Égert et al. (2005)

[10] In a weakened version, relative PPP has often been interpreted in terms of a mean reversion process. The real exchange rate does not have to be constant but rather revert to a constant mean. The estimated deviation from the relative PPP has, in many studies, a half-life of four years. See e.g. Frankel and Rose (1995) for a panel projection of PPP.

3.2.1 Explanations for the adjustment of the relative prices

Most of the theoretical work on the real exchange rate determinants relies on the assumption that relative PPP holds in the external sector. The fluctuation of the real exchange rate is then explained by variations in the relative price between tradables and nontradables. The theoretical approaches behind the adjustment of tradables prices in terms of nontradables can be broadly divided into two groups. The first group includes models that explain the relative price movements from the supply side of the economy. The best known two approaches are the Balassa-Samuelson effect and the relative factor endowments effect - as proposed by Bhagwati (1984). The second group of explanations refers to demand side factors such as shifts of private consumption demand from tradables to nontradables (Bergstrand 1991), increasing government spending or investment demand as a share of GDP and shifting the overall demand toward nontradable goods (e.g. Edwards 1989, De Gregorio and Wolf 1994, Schröder and Pfadt 1998). Besides these two main groups, increasing relative price of nontradables can be induced by transition specific factors like e.g. price liberalization.

3.2.1.1 Supply-side explanations

Productivity growth in the sector of tradables

In the spirit of Balassa (1964) and Samuelson (1964), a rapid increase in the productivity of the tradables sector (mainly manufacturing) relative to that of the nontradables sector (mainly services) can lead to increasing relative prices of nontradables. If this effect is stronger in the home than in the foreign country and the real exchange rate of the external sector is constant in accordance with relative PPP, this implies a real appreciation of the home currency.[11] The starting point is a model of a small open economy, in which both tradable and nontradable

[11] As visible from the decomposition of the RER, the weight of nontradables in the overall consumption expenditures also has to be accounted for (see equation (3.5), p. 52). Significantly lower weights of nontradables in the CEEC than in industrialized countries can be considered as an explanation for the low power of approaches ascribing the real appreciation to the movements of the relative prices (see e.g. Égert et al. 2003). The increase in the price of nontradables relative to tradables in the home country can only result in real appreciation if it exceeds the increase in the corresponding relative price abroad by an extent accounting for the different share of nontradables.

goods are produced according to constant-returns-to-scale Cobb-Douglas production functions of capital and labor employed:[12]

$$Y_T = A_T \cdot L_T^b \cdot K_T^{(1-b)} \tag{3.7}$$

$$Y_N = A_N \cdot L_N^c \cdot K_N^{(1-c)}, \tag{3.8}$$

where Y, L, K, A denote output, labor, capital and total factor productivity, respectively. The values of b and c are restricted as follows: $0 < b, c < 1$. Furthermore, labor elasticity of production is larger in the nontradables sector than in the sector of tradable goods, $c > b$.

According to relative PPP in the external sector, prices of tradable goods result from the world market equilibrium and are therefore exogenous to the model. The capital stock is fixed for one period ahead and capital costs are determined under the assumption of full capital mobility by the world market interest rate. It is further assumed that intersectoral (but not international) labor mobility leads to nominal wage equalization between the two sectors of the economy and that operating under the conditions of perfect competition implies a real wage equal to marginal labor productivity in each sector. The profit maximization problem leads to following first-order conditions:

$$A_T \cdot (1-b) \cdot \left(\frac{1}{K_T/L_T}\right)^b = \frac{i}{P_T}, \tag{3.9}$$

$$A_T \cdot b \cdot \left(\frac{K_T}{L_T}\right)^{(1-b)} = \frac{W}{P_T}, \tag{3.10}$$

$$A_N \cdot c \cdot \left(\frac{K_N}{L_N}\right)^{(1-c)} = \frac{W}{P_N}, \tag{3.11}$$

$$A_N \cdot (1-c) \cdot \left(\frac{1}{K_N/L_N}\right)^c = \frac{i}{P_N}. \tag{3.12}$$

i denotes the interest rate and W the nominal wage in the economy. Equation (3.9) can be used to determine labor input in the sector of tradables, L_T, since it is the only variable which is not predetermined by the assumptions. From equation (3.10) the nominal wage in the tradables sector can be calculated, which prevails also in the sector of nontradables due to intersectoral labor mobility. Equations (3.11) and (3.12) represent a system of two equations in two variables, labor input in the sector of nontradables and (relative) price of nontradables. Therefore, the

[12] See e.g. Égert et al. (2003).

relative price of nontradables is independent from demand factors and solely given by the supply side conditions.

An increase of productivity in the sector of tradables leads to rising nominal wages, which is then transferred to the closed sector where the productivity improvement is smaller. Increasing labor costs in this sector are then compensated by raising the prices of nontradable goods. If the productivity growth in the external relative to the sheltered sector in the home country is larger than in the foreign country, the prices of nontradables increase faster at home than abroad, thus inducing real appreciation of the home currency (after accounting for the different weights of nontradables in consumption). Moreover, since wages rise proportionally to productivity in the tradables sector, this kind of real appreciation does not harm international competitiveness.

Some authors differentiate between internal and external transmission mechanism when analyzing the Balassa-Samuelson effect (see e.g. Égert et al. 2003). The internal transmission mechanism refers to the relationship between productivity growth in the tradables sector and overall inflation.[13] The external transmission mechanism is then the connection between productivity developments in two countries and the real exchange rate.

Any empirical analysis of the Balassa-Samuelson effect requires answers to the following questions:

1. What goods and services belong to the tradables sector and what goods are nontradable?

2. Has growth of productivity in the sector of tradables been higher than in the sector of nontradables?

3. Has productivity development led to increasing relative prices of nontradables to tradables? This relationship can be derived from the first order

[13] Égert et al. (2003) use the term "overall inflation". However, it should be stressed that in the case of fixed money supply price level even falls with increasing average productivity. Therefore, productivity growth does not necessarily result in overall inflation.

conditions of the profit maximization problem:

$$\frac{P_T}{P_N} = \frac{\partial Y_N/\partial L_N}{\partial Y_T/\partial L_T} = \frac{c \cdot Y_N/L_N}{b \cdot Y_T/L_T} = \frac{1}{\frac{bY_T/L_T}{cY_N/L_N}} \tag{3.13}$$

Therefore, the price of tradables relative to nontradables should decrease if average labor productivity in tradables rises faster than in nontradables, whereas the absolute value of the coefficient is expected to be smaller than one, as $c > b$ by assumption.

4. Has productivity growth in tradables relative to nontradables been faster in the home country than abroad?

5. Has productivity development in the home country and abroad induced an increase of relative prices of tradables to nontradables that is faster in the home country than abroad? This relationship can be represented by the following equation:

$$\frac{\frac{P_T}{P_N}}{\frac{P_T^*}{P_N^*}} = \frac{\frac{c}{b} \cdot \frac{Y_N/L_N}{Y_T/L_T}}{\frac{c^*}{b^*} \cdot \frac{Y_N^*/L_N^*}{Y_T^*/L_T^*}} \tag{3.14}$$

The fact that the Balassa-Samuelson effect is at work in the countries of Central and Eastern Europe has been empirically supported by and large. The only point of contention is the magnitude of the effect. In many empirical analyses strong evidence is presented that more than half the real exchange rate movements can be interpreted as driven by the productivity growth in the external sector of the CEEC (Golinelli and Orsi 2002, Jazbec 2002). However, a second strand of literature claims that the productivity development in CEEC explains less than half the real appreciation (Backe et al. 2003, Égert et al. 2003, Mihaljek and Klau 2003). The assumptions underlying the effect of Balassa and Samuelson are separately analyzed e.g. in Breuss (2003), Égert et al. (2002) and Nenovsky and Dimitrova (2002). The main reason why the latter studies find only a weak Balassa-Samuelson effect in the CEEC is the violation of PPP in the external sector. Furthermore, low flexibility of the labor market and the relatively low weight of nontradables in overall consumption expenditures compared to industrialized countries can also be considered as factors that limit the impact of the Balassa-Samuelson effect. Thus far, a main drawback of the empirical analyses of the Balassa-Samuelson effect is the insufficient examination of the relative productivity between tradables and nontradables. A differentiation of the sectors of tradables and nontradables is missing and the relative productivity is mostly

proxied by productivity in manufacturing or by overall labor productivity.

Relative factor endowment

The general equilibrium framework is also applied by Bhagwati (1984) to explain the differences in relative prices among countries. In addition to the Balassa-Samuelson approach, Bhagwati's explanation relies on the different relative factor endowments: poor countries tend to be endowed with more labor relative to capital compared to rich countries and thus have lower wage-rental ratios. This is the reason why nontradables are relatively cheaper in poor countries, since these goods are more labor-intensive compared to the tradables. Increasing capital stock leads therefore to real appreciation via higher prices of nontradables relative to tradables. The operationalization of this approach has often been carried out by including GDP per capita as a proxy since no reliable data about the capital stock is available. However, this variable does not discriminate between the factor endowment effect and other explanations like the Balassa-Samuelson effect or demand shifts if the latter are not explicitly accounted for.

Besides the Balassa-Samuelson effect and the effect described by Bhagwati (1984), there is a range of explanations for real appreciation in CEEC with focus on the demand side of the economies.

3.2.1.2 Demand-side explanations

Shift in relative consumption

Bergstrand (1991) proposed to explain the real exchange rate development by shifts in the structure of the consumption expenditure. His considerations rely on the Linder-Hypothesis that with higher income "products filling new needs are added" (Linder 1961).[14] Assuming non-homothetic preferences of the representative household, Bergstrand assumes that the nontradables (tradables) demand exhibits an income elasticity larger (smaller) than one. Therefore, increasing income leads to a change in the composition of private consumption with demand

[14]The shift in economic structures toward the tertiary sector was already a topic of discussion in the 1930s. See Clark (1940).

for nontradable goods showing a disproportionately high growth. The shift of private consumption toward nontradables raises their relative price and causes an appreciation of the real exchange rate. In the literature thus far, only Coricelli and Jazbec (2004) allow explicitly for an adjustment of the consumption structure in their analysis of the real exchange rate in the CEEC. However, they do not distinguish between luxury and basic goods but rather use private consumption of services as proxy for luxury goods.

Public expenditures

The structure of total demand can be further influenced by public expenditures. On the one hand, fiscal policy can bring about a change in the relative price of nontradables via its income and substitution effects. On the other hand, the structure of government expenditures should also be accounted for. Given the labor-intensive nature of public goods, it can be assumed that higher labor demand will raise prices of nontradables, which tend to be labor-intensive as well. Furthermore, debt-financed fiscal expansion leads to capital imports over increasing real interest rates and therefore to real appreciation.

By and large, the empirical evidence confirms the hypothesis that expansionary fiscal policy leads to real appreciation (De Gregorio and Wolf 1994, De Gregorio, Giovannini and Wolf 1994, Edwards 1989). With regard to the countries of Central and Eastern Europe, Égert, Halpern and MacDonald (2005) list ten empirical works showing that increasing government expenditure leads to real appreciation and two in which the opposite effect was the case.

Investment demand

Most of the evidence on the appearance of a productivity-driven real appreciation relies on the transmission channel of the Balassa-Samuelson effect. However, Fischer (2002) argues that technological advances can influence the real exchange rate via a second channel as well, namely through increasing investment demand. The model assumes that part of the investment expenditures fall on nontradable

goods, such as infrastructure or the installation of new capital goods. In accordance with the proposition of Schröder and Pfadt (1998), Fischer demonstrates that the productivity gains attracting home and foreign direct investment lead to an increasing demand for nontradables and thus contribute to the real appreciation via increasing relative prices of nontradables in terms of tradables. Increasing investment demand is, thus, expected to lead to real appreciation via increasing prices of nontradables if the share of nontradables in investment, like installation cost etc., exceeds the share in the consumption demand which has been substituted by the additional investment demand.[15]

Further explanation for the relationship between investment and the real exchange rate is based on the effect described by Bhagwati (1984). Increasing net investment leads to accumulation of capital stock and therefore raises the capital/labor ratio in the particular country. In accordance with the argumentation by Bhagwati (1984) this causes real appreciation via decreasing price of tradables relative to nontradables since the production of tradables is more capital-intensive than the production of nontradables. Furthermore, increasing supply of domestic tradables leads to a depreciation of the real exchange rate of the tradables sector.

3.2.1.3 Price liberalization

The process of price liberalization affects the real exchange rate both in the medium and the long run. In the later years of transition, most of the regulated prices in the CEEC relate to nontradables like communication services and basic goods like electricity and water supply and can affect the real exchange rate via the channel of both the relative prices and the RER of tradables. The liberalization of prices directly affects the overall price level in the short to medium run through an adjustment of prices to the level of marginal costs under the assumption of perfect competition. Given that the price regulation concerned mainly nontradable basic goods, deregulation should lead ceteris paribus to decreasing relative price of tradables in terms of nontradables. Furthermore, the negative income effect associated with increasing prices of basic goods combined with the inelastic demand for these goods is expected to negatively affect the demand for

[15]However, the lack of detailed data on services in the area of investment makes it impossible to test this proposition.

imported or luxury goods. The consequence of this secondary effect will be declining prices of domestically produced tradables in terms of nontradables if non-basic goods are mainly tradables. To sum up, the short to medium term effect of price liberalization on the real exchange rate is expected to lead to real appreciation of the sheltered sector. The exposure to price competition is expected to cause real depreciation in the long run.

3.2.2 Explanations for the movement of the real exchange rate in the external sector

Most of the conventional explanations for real exchange rate appreciation in rapidly growing economies assume that PPP holds in the tradables sector and attribute the real appreciation to increasing relative price of nontradables. In CEEC real exchange rates in the tradables sector have appreciated as well.[16]. The present subsection summarizes some potential explanations for the development of RER in the tradables sector. All determinants of the RER of the external sector are supply side factors.

Quality improvement in the bundle of tradables

Although the small open economies from Central and Eastern Europe cannot affect the prices of tradable goods on the world market, it is possible for them to experience a change in the composition of the share of the consumption basket containing tradable goods and/or in the quality of these goods. A change in the reputation of home-produced goods on the world market, sound marketing measures and the shift of production toward goods with higher technological content or of better quality could explain the relative increase in prices of tradable goods compared to the world market level (see Égert and Lommatzsch 2004, Oomes 2005). An empirical investigation of this explanation is provided by Égert and Lommatzsch (2004) who assume that increased production quality is directly linked to productivity improvement in the tradables sector during the process of transition. However, using productivity as a proxy for the effect of quality improvement and better reputation of the home-produced tradable goods on the world market does not allow for distinguishing this effect from the conventional impact of productivity

[16]See Figures 3.3-3.4, pp. 94f.

via the Balassa-Samuelson effect. Alternatively, the effect can be approximated by the amount of foreign direct investment (FDI) inflows since the beginning of the transition process, since it has been driven by and large by the import of know-how or broadly by the activity of foreign investors. An increase in foreign direct investment is expected to lead to a quality improvement or a shift of production toward goods with higher technological content, which, in turn, increases the prices of tradable goods produced in the home country and leads to appreciation of the real exchange rate of the external sector.[17] However, an increase in FDI inflows also augments supply in the tradables sector and can thereby lead to a depreciation of the real exchange rate in the external sector.

Further explanations for the development of the real exchange rate in the external sector can be found in some transition specific changes in the CEEC. Fischer (2002) proposes to explore the effect of trade and price liberalization as well as that of the privatization process on the real exchange rate. Whereas price liberalization concerns mainly nontradable goods and services, trade liberalization and privatization are possible explanations for real appreciation in the tradables sector.

Trade liberalization

In a small open economy model the liberalization of international trade, also associated with an increasing degree of openness, can lead to depreciation of the real exchange rate of the external sector in the long run because it intensifies the price competition on the national market of tradables. However, at the beginning of transition it is also possible to observe an adjustment of the home market to world market conditions improving marketing and the quality of exports.[18] Opening for international trade can then lead to real appreciation due to the increasing prices of the tradable goods in which these countries have comparative advantage.

[17] Depending on the industry in which the FDI is allocated, the same argumentation can also be applied to the real exchange rate of the sheltered sector.

[18] This effect should occur independently of the activity of foreign investors.

Privatization

Depending on the industry to which the privatized enterprises belong, the private sector share in gross domestic product (GDP) can influence both the RER of the external sector and the relative price of tradables in terms of nontradables. Privatization and the increasing private sector share in GDP increase the investment opportunities for home residents as well as for foreign investors. Improving technology in production can lead to higher quality and prices of tradable and nontradable goods produced in the home country. Therefore, real exchange rate appreciation would be the result. However, this effect should be captured to a large extent by the amount of FDI relative to GDP. Furthermore, increasing private sector share in GDP leads to a lower share of subsidized prices. However, the direct effect of price liberalization can be captured by the share of administered prices in CPI, as described below.

Moreover, it is also possible to observe a long run depreciation of the RER when the private sector share in GDP increases since it is also associated with intensification of competition.

In his empirical analysis, Fischer measures the impact of the institutional arrangements respectively by the tariff revenues as a percentage of imports, the share of administered prices in CPI and the private sector share in GDP. The results show that only the privatization variable has a strongly significant coefficient implying appreciation of the RER as a result of progress in privatization between 1993 and 1999. In the present analysis, the influence of the transition specific changes will be further investigated using a longer time span and controlling for their impact on both components of the RER. The tariff revenues as a measure of the progress in trade liberalization will be replaced by the degree of openness, since it was not exactly the tariff policy that had blocked the international trade in the centrally planned economies.

The real appreciation of the external sector can be considered one of the specific characteristics of the transition process. It is mainly driven by the structural changes on the way to a market economy and the adaptation to world market conditions. It should diminish as the transition process goes forth.

Figure 3.2 summarizes the factors for the dynamics of the real exchange rate in the CEEC. In empirical investigations involving the tradables/nontradables dichotomy, it has been a difficult task to find a price index capturing solely the prices of tradables. Whatever price index used, it always has some nontradable components, including nontradable services like distribution, marketing, before and after sales services, etc. (see among others Kravis and Lipsey 1978). Thus, it cannot be ruled out that driving forces of the relative price of tradables to nontradables affect the real exchange rate of the external sector as well (see e.g. Égert et al 2005). This is represented by the dashed lines in Figure 2.

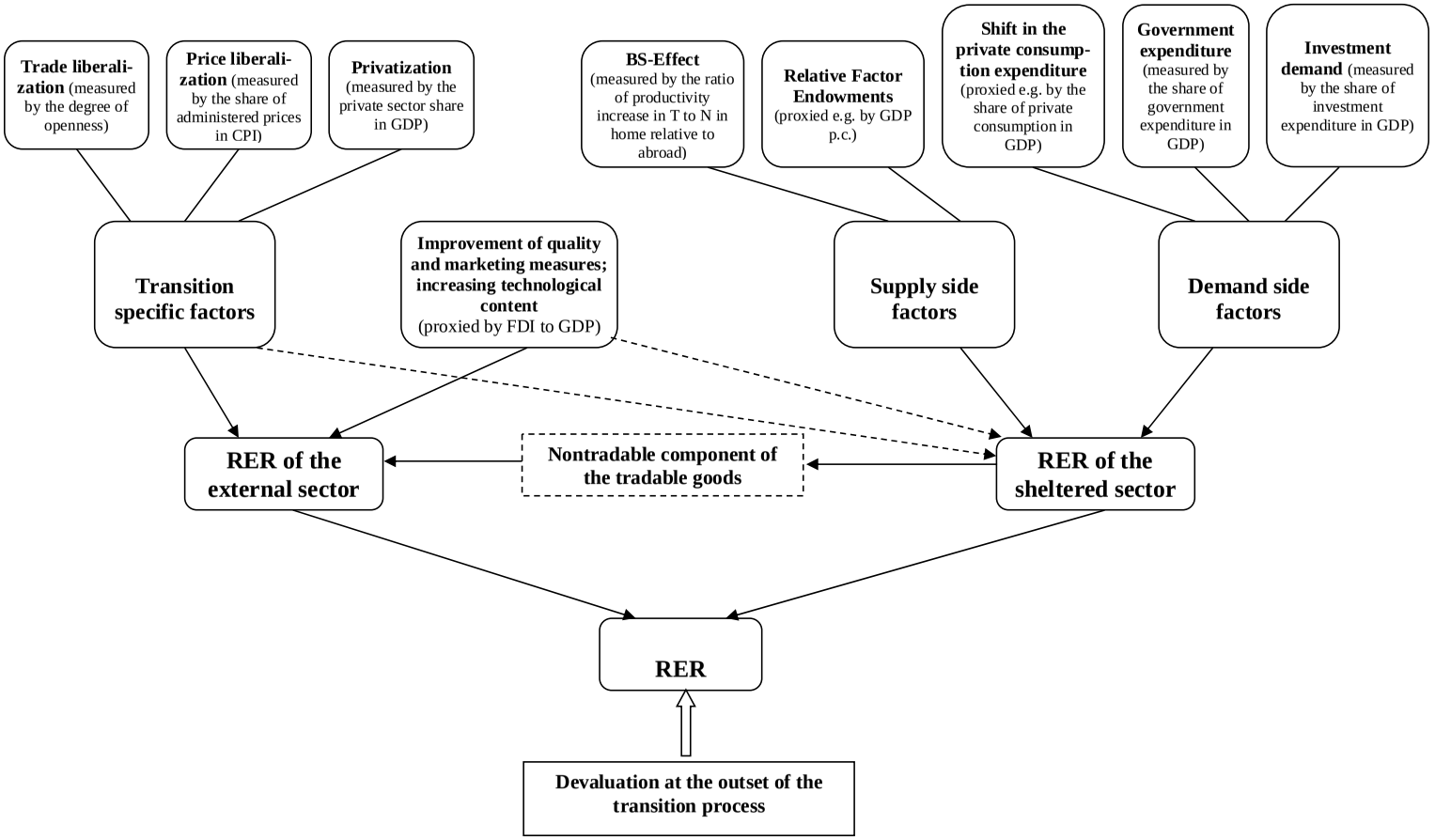


FIGURE 3.2: Theoretical explanations for the RER dynamics in the CEEC

Dashed lines indicate that the corresponding explanation has been introduced in the section about the driving forces of the RER in the external sector but can also apply for the RER of the sheltered sector depending on the goods or prices the measures actually affect. Dashed boxes stand for the indirect effect between the two components of the overall RER.

3.3 Analysis of disaggregated consumer prices

The discussion in the preceding section points out that there is a range of possible explanations for the real exchange rate appreciation in transition economies. A closer look at disaggregated consumer price data should provide a first impression about the explanatory power of some of the effects described above. Whereas productivity data is necessary in order to evaluate whether, and to what extent, real appreciation is driven by Balassa-Samuelson effects, the analysis of consumer prices can provide answers to several questions:

1. Has the real exchange rate in services been appreciating faster than the overall real exchange rate?
2. To what extent has real appreciation been driven by transition specific factors like price and trade liberalization, e.g. in the energy sector?
3. Have consumption expenditures shifted away from basic goods like food and toward more luxury goods and services, as proposed by Bergstrand (1991)?[19]
4. How important is the emergence and further development of markets for new goods and services, e.g. in the field of telecommunication and high technology?

The present section uses Harmonized Index of Consumer Prices (HICP) provided by Eurostat. The index contains twelve categories and comprises the prices of all goods classes with share in total consumption expenditure larger than $\frac{1}{1000}$. Data is available beginnning in 1996 for most of the CEEC under consideration. However, in some cases analysis is constrained by the fact that for some categories and subcategories time series begin later. For each category, the real exchange rate is calculated against the Euro area average based on the HICP for the goods and services contained in the category. The so obtained real exchange rates are represented as indices with 2005 as base. The terms *real appreciation* and *relative price increase compared to the Euro area average* are used synonymously.

Some common trends can be identified for most of the countries. Therefore, they are not discussed separately for each country but rather are mentioned for the first country and summarized at the end of the present section. Especially specific

[19] This question will be analyzed in detail in the next section. The present section is therefore merely suggestive with respect to this question.

development trends for the concrete country are listed and further analyzed where reliable information is available.

3.3.1 Bulgaria

HICP data for Bulgaria is available for the most categories since 1997 (Table 3.1). From 1997 to 2013, the overall real exchange rate appreciated by 45.9 percent. The real appreciation based on services prices amounted to 68.8 percent and was higher than that of the overall real exchange rate.

The largest price increase, at 99.8 percent, relative to the Euro area was observed in the field of education. Especially tertiary education experienced a rapid price increase since the Higher Education Act of 1995 built a legal fundament for private universities. In 2013, there are 20 private colleges and universities, and the fees are about three times higher than in public universities (which have experienced a rapid price increase since 1995 as well). The share of education in overall HICP has doubled between 1997 and 2013, although it is still lower than one percent.

A further category with high growth of relative prices compared to the Euro area is alcoholic beverages, tobacco and narcotics. Real appreciation based on prices of these goods amounted to 80.3 percent and was mainly driven by hikes in excise duties. For instance, since 1997 specific excise taxes on tobacco have increased from 9 to 101 BGN per 1000 units (Skafida et al. 2012). As a result, the share of the products contained in this category in overall HICP increased from 3.9 percent in 1997 to 7.1 percent in 2013, although according to Eurobarometer data the number of tobacco consumers has decreased between 2004 and 2012.

The real appreciation in the communication industry amounted to 56.8 percent and was brought about by a sharp boost of prices for telephone and telefax services. In the same time the share of consumption expenditure for telecommunication services measured by the weight of these services in the overall HICP increased tenfold - from 0.6 percent in 1997 to 6.2 in 2013. This development is due to the introduction and expansion of internet services as well as mobile telephone services. The largest mobile phone operator, M-Tel, was founded in 1994. In 2013, its subscribers amount to more than 4 Mio., or more than half of the population of Bulgaria. As regards to internet provision, almost half of the households still do

Table 3.1: Development of HICP and weights in Bulgaria, 1997 - 2013

HICP category	RER growth based on HICP prices in the category	Weight of category in % of total consumption expenditure	
	in %	1997	2013
Food and non-alcoholic beverages	-35.2	48.7	22.2
Alcoholic beverages, tobacco and narcotics	-80.3	3.9	7.1
Clothing and footwear	-25.8	8.8	3.3
Housing, water, electricity, fuels	-62.3	12.0	9.5
Furnishing, household equipment and maintenance	-2.4	5.2	6.4
Health	-67.9	2.2	6.7
Transport	-47.6	9.3	19.7
Communication	-56.8	0.6	6.2
Recreation and culture	-52.1	2.3	5.8
Education	-99.8	0.5	1.0
Restaurants and hotels	-62.4	3.2	7.0
Miscellaneous goods and services	-56.2	3.5	5.1
Overall HICP	-45.9	100	100
Services	-68.8	9.4	32.4

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.

not have an internet connection (Special Eurobarometer 396). In Germany, less than one third of the households do not have access to internet, and in Sweden and the Netherlands even less than 10 percent. Consequently, the demand for communication services is expected to further increase in the future, therefore creating addiitonal upward pressure for the prices in this area. Considering conventional explanations for real exchange rate appreciation, this development comes next to the approach proposed by Bergstrand (1991). With higher income, new products, besides basic products like food and apparel, are introduced.

Another area of consumption goods with price increases above average relative to the countries of the EMU is the category comprising housing, water, electricity, gas and other fuels. The real appreciation based on the prices of these goods amounts to 62.3 percent since 1997. The price of electricity has increased rapidly relative to

the Euro area. According to data by Eurostat, Bulgaria still has the lowest nominal price for electricity among the EU member states at 0,096 EUR/kWh. The weight of housing and the other goods in this category in the consumption basket of Bulgarian households has decreased from 12.0 percent in 1997 to 9.5 percent in 2013. Negative supply shocks in recent years were caused by the deactivation of four out of six units of the nuclear power plant of Bulgaria as well as by the reorientation toward higher share of renewable energy sources in total energy production.

The share of food and non-alcoholic beverages dropped from 48.7 percent in 1997 to 22.3 percent in 2013, although the real exchange rate in this sector appreciated by a rate lower than that of the overall real exchange rate. Similar development can be observed also in the area of clothing and footwear, where the share in the overall HICP shrank from 8.8 percent in 1997 to 3.3 percent in 2013 while the relative prices experienced an increase of only 25.8 percent compared to the Euro area average. The development of price and share of these two areas in overall HICP is also supportive for the explanation proposed by Bergstrand (1991) since they indicate that basic goods have lost share in total consumption expenditure.

One sector that has made significant gains in importance since 1997 is transport, comprising among others the purchase of transport vehicles. The share of transport in consumption demand has increased from 9.3 percent in 1997 to 19.7 percent in 2013, and the price development is comparable to the overall HICP. However, the single prices contained in this group of goods and services have experienced very different trends. Whereas the price of transport services has increased by over 65 percent relative to the Euro area average, the relative price for the purchase of vehicles has decreased by 37.9 percent. The share of fuels and lubricants rose from 3.6 to 8.7 percent in overall HICP and the prices jumped by 35.6 percent. It has often been claimed that fuel cartels drive fuel prices up in Bulgaria. However, Bulgaria's Competition Protection Commission found no evidence on this matter. Prices for cars decreased by almost 20 percent since the current economic crisis reached Bulgaria at the end of 2007, while prices remained stable in the Euro area on average. Further price decreases are expected in the future when the supply of Chinese automobiles gains in importance. In 2012, Chinese automotive companies began to assemble road vehicles in Bulgaria, and further expansion is expected by the end of 2013 (GTAI 2013). Although Bulgaria is not that important as a market, increasing supply of low-cost cars is expected to impose downward pressure

on domestic prices.

The weights of two areas with mostly luxury goods and services, recreation and culture as well as restaurants and hotels, in overall HICP have more than doubled - from 2.3 to 5.8 percent and from 3.2 to 7.0 percent, respectively. The relative prices in these categories have increased by 52.1 and 62.4 percent, respectively and therefore faster than the overall real exchange rate appreciation. This development is consistent with the conventional explanations for real appreciation in rapidly growing economies although not all goods and services contained in these categories are nontradables.

3.3.2 Czech Republic

For the Czech Republic, data for the main categories is available dating back to 1996. Detailed analysis of the price development is only possible for the time period 2000-2013 since detailed data prior to 2000 is missing. In most categories, the development is similar to that in Bulgaria (Table 3.2). However, there are some notable exceptions. The overall real exchange rate appreciated by 38.2 percent since 1996 and by 29.3 percent since 2000. Real exchange rate appreciation was with 37.1 percent since 2000 higher in the sector of services.

In the Czech Republic, the shift in the consumption basket from basic goods to more services and luxury goods started earlier than in Bulgaria. In 1996, the share of food and nonalcoholic beverages was as low as 27.6 percent (compared to 48.7 in Bulgaria in 1997) and that of clothing and footwear amounted to 8.1 percent. In 2013 food and nonalcoholic beverages make up only 17.7 percent of the consumption basket (in Bulgaria still 22.2 percent). The share of clothing and footwear shrank in the same time span to 3.7 percent. The real exchange rate based on the price development of food and nonalcoholic beverages appreciated with a pace well below the overall real exchange rate. The real exchange rate based on the price index for clothing and footwear even depreciated against the Euro area average. Therefore, a negative shock in relative demand can explain the price movements in these two areas, as e.g. proposed by Bergstrand (1991).

TABLE 3.2: Development of HICP and weights in the Czech Republic, 1996 - 2013

HICP category	RER growth based on HICP prices in the category	Weight of category in % of total consumption expenditure	
	in %	1996	2013
Food and non-alcoholic beverages	-26.8	27.6	17.7
Alcoholic beverages, tobacco and narcotics	-32.4	5.4	10.4
Clothing and footwear	11.8	8.1	3.7
Housing, water, electricity, fuels	-71.4	12.1	17.4
Furnishing, household equipment and maintenance	-8.0	8.1	6.5
Health	-65.1	1.0	2.9
Transport	-19.7	10.8	11.2
Communication	-69.0	1.9	3.5
Recreation and culture	-38.4	12.1	9.6
Education	-50.6	0.2	0.8
Restaurants and hotels	-37.1	6.9	8.8
Miscellaneous goods and services	-40.7	5.7	7.2
Overall HICP	-38.2 / -29.3[1]	100	100
Services	-37.1[1]	27.2[2]	33.1

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.
1: since 2000, 2: in 2000

Unlike in Bulgaria, the RER appreciation based on prices of alcoholic beverages, tobacco and narcotics is below average in the Czech Republic. Excise duties in 1996 were already high, so the increase was not as pronounced as was the case in Bulgaria.[20]

In the area of housing and telecommunications, the weights increased from 12.1 and 1.9 percent in 1996 to 17.4 and 3.5 percent, respectively. In these sectors the most pronounced real appreciation was observed, about 70 percent since 1996 in each case. More detailed data shows that the price increase in housing is mainly driven by the prices of housing rentals and gas. Rental increases were caused by deregulation, which came into force in 2007. Until the beginning of 2007 about one fifth of the population lived in houses with regulated rents. Rentals for housing

[20]See e.g. Shirane et al. 2012.

are weighted 4.6 percent in overall HICP and increased by 58 percent relative to the Euro area average since 2000. A shift from heat energy to gas resulted in an increasing weight for gas from 1.8 to 3.2 percent in consumption demand and decreasing weight for heat energy from 4.1 to 2.1 percent. Gas prices subsequently increased by 60 percent as compared to Euro area.

3.3.3 Estonia

Data for most categories of the Estonian HICP is available beginning in 1996. The real exchange rate based on the overall HICP appreciated by 35.1 percent during the time span from 1996-2013 (Table 3.3). Real appreciation in services was above average. In the main categories with the largest shares in HICP, the appreciation is most pronounced in housing, transport and restaurants and hotels, and less than average in furnishing and household equipment, food and non-alcoholic beverages, alcoholic beverages, tobacco and narcotics and recreation and culture. Some evidence in favor of relative price increase of nontradables to tradables, as e.g. in the Balassa-Samuelson effects, can be observed in the data. On the one hand, services like those contained in the categories recreation and culture and transport experienced above average increases in prices relative to the Euro area average. On the other hand, the price development for typically tradable goods has been quite different: while goods contained in the category clothing and footwear have experienced above average relative price increase, the opposite holds true for furnishing and household equipment. The prices for vehicles purchased decreased as compared to the Euro area. The index capturing price development of services in Estonia is available back to 1998. The service based real appreciation amounted to 36.2 percent from 1998-2013, whereas the overall real exchange rate appreciated by 27.6 percent during the same time period.

Again, a relatively large real appreciation has been observed in the category communication, at 51.5 percent. Both services and equipment experienced sharp price increases due to intensified use of high technologies like internet and mobile telephone communication. The share of communication in overall HICP has doubled since 1996 and amounts to 4.2 percent in 2013. Other categories with increasing share in total consumption expenditure are transport, health and recreation and culture. The share of transport increased from 6.5 percent in 1996 to 13.8 percent in 2013. Consumption expenditure in 2013 is more than double what it was in 1996 in most subcategories in transport, including purchase of vehicles, fuels and

Table 3.3: Development of HICP and weights in Estonia, 1996 - 2013

HICP category	RER growth based on HICP prices in the category	Weight of category in % of total consumption expenditure	
	in %	1996	2013
Food and non-alcoholic beverages	-28.1	36.5	21.2
Alcoholic beverages, tobacco and narcotics	-24.5	6.3	9.0
Clothing and footwear	-43.3	7.6	6.5
Housing, water, electricity, fuels	-56.5	21.6	14.7
Furnishing, household equipment and maintenance	-9.4	6.1	4.6
Health	-43.9	1.3	3.4
Transport	-35.2	6.5	13.8
Communication	-51.5	2.1	4.2
Recreation and culture	-30.8	5.3	7.8
Education	-53.4	0.1	1.4
Restaurants and hotels	-46.2	3.1	8.7
Miscellaneous goods and services	-37.4	3.4	4.6
Overall HICP	-35.1 / -27.6[1]	100	100
Services	-36.2[1]	12.7[2]	29.2

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.
1: since 1998, 2: in 1998

lubricants and transport services. Whereas prices of vehicles decreased compared to the Euro area, a sharp increase in prices was observed in transport services and fuels and lubricants for personal transport equipment.

The share of goods and services contained in recreation and culture increased from 5.3 percent in 1996 to 7.8 percent in 2013, and the real appreciation in this sector was at 30.8 percent, thus below average. The highest price increases were recorded in recreational and cultural services and newspapers, books and stationery. The share of recreational and cultural services in overall HICP increased from 0.7 to 2.1 percent, therefore indicating that price increase could be the result of a positive shift in demand. The share of newspapers, books and stationery decreased slightly, probably due to the common trend in this sector to switch from printed media to electronic media.

In the health sector, the share of goods and services in total HICP increased from 1.3 percent in 1996 to 3.4 percent in 2013. In 1996 the category of health consisted of medical products, appliances and equipment. In 2013 the share of these goods was 2.3 percent of overall HICP and additional goods like outpatient services (0.9 percent) and hospital services (0.3 percent) were included. The real appreciation in this sector was 43.9 percent. Disaggregated data on the price development is available since 2001. The largest price increase was observed in medical and pharmaceutical services at 81.4 percent relative to the Euro area. On the contrary, the price increase in medical products, appliances and equipment was below average at 19.7 percent.

The price increase in housing relative to the Euro area was 56.5 percent and therefore well above the overall real appreciation. Electricity prices experienced an especially sharp 81.9 percent hike (in relative terms). The energy sector was characterized by a monopolistic structure until recently. Market opening in 2013 will allow for other suppliers, especially from the other Baltic countries and Finland, to serve the local market and therefore increase efficiency. In 2006, the parliament adopted new legislation on renewable energy and in 2010 renewable energy already accounted for 11 percent of Estonian internal energy production (Schneider 2013). By 2020, energy from renewable sources should account for 25 percent of consumption. Therefore, further price increases in this area are possible despite increasing competition.

The price increase in the housing category was accompanied by a strong decrease in the share of housing expenditures in total consumption, from 21.6 percent in 1996 to 14.7 percent in 2013. Disaggregated data for the shares of subcategories in housing, water, electricity, gas and other fuels is available since 1998. The only component in this category with an increasing share is rentals for housing. The share increased from 0.9 percent in 1998 to 1.8 percent in 2004 and fell again as a result of sharply increasing rentals during 2006-2008. In 2013, rentals for housing accounted for 1.2 percent of the overall consumption basket. The share of the other components in the housing category has decreased since 1998. A sharp decrease in the share of heat energy and other services relating to the dwelling (n.e.c.) was observed between 2000 and 2001. Primary energy consumption per unit of GDP fell over the period 1995-2009 by as much as 4.4 percent p.a. (ABB 2011), with the highest rates being recorded in the period 1995-2000. However, energy prices experienced rapid increases in that period as well and did not allow for decrease

in consumption expenditure in this area. As the price increase slowed down and energy efficiency continued improving, the share of energy in overall consumption dropped. Prices of electricity decreased compared to the Euro area between 2002 and 2005.

The share of other basic consumption goods like food and non-alcoholic beverages and clothing and footwear decreased as well. Whereas food and non-alcoholic beverages accounted for 34.2 percent in 1996, the share of these basic goods in total consumption was 19.8 percent in 2013. The real appreciation based on the price index in this sector amounted to 28.1 percent and was slightly below average. The price development in this category can be interpreted in the sense of relative shift toward non-basic goods driven by a positive income effect as proposed by Bergstrand (1991). In clothing and footwear, prices have increased by 43.3 percent since 1996 as compared to Euro area, and the share in total consumption decreased from 7.6 percent in 1996 to 6.5 percent in 2013. Therefore, relative demand shifted in favor of goods other than clothing and footwear confirming again the presence of the effect described in Bergstrand (1991).

3.3.4 Latvia

The overall real exchange rate in Latvia appreciated by 34.9 percent during the time period 1996-2013 (Table 3.4). As in the case of Estonia, the real appreciation based on the price index for services was at 41.3 percent, thus higher than the overall real appreciation. The highest price increase relative to the Euro area was observed in the telecommunication category, 56.0 percent, and the share of the goods and services contained in this category increased from 1.2 percent in 1996 to 3.8 percent in 2013, the explanation for which is the same as the countries.

As in Estonia, the structure of consumption expenditure experienced a similar overall development with three main differences: Firstly, the decline of the share of food and non-alcoholic beverages was more pronounced in Latvia - from 42.0 percent in 1996 to 23.5 percent in 2013. Meanwhile, prices increased by 40.5 percent and therefore more rapidly than in Estonia. Secondly, the share of housing in overall consumption expenditure remained relatively stable at about 16.0 percent, whereas the price increase was again above average at 54.2 percent. Lastly, the

Table 3.4: Development of HICP and weights in Latvia, 1996 - 2013

HICP category	RER growth based on HICP prices in the category	Weight of category in % of total consumption expenditure	
	in %	1996	2013
Food and non-alcoholic beverages	-37.7	42.0	23.5
Alcoholic beverages, tobacco and narcotics	-46.8	5.8	7.5
Clothing and footwear	-13.6	8.8	5.5
Housing, water, electricity, fuels	-54.2	16.0	15.8
Furnishing, household equipment and maintenance	-11.4	3.2	4.1
Health	-40.9	3.3	5.2
Transport	-35.4	7.1	14.9
Communication	-56.0	1.2	3.8
Recreation and culture	-23.4	5.5	7.1
Education	-52.4	0.8	1.4
Restaurants and hotels	-34.9	3.5	6.5
Miscellaneous goods and services	-27.8	2.8	4.7
Overall HICP	-34.9	100	100
Services	-41.3	15.9	29.3

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.

share of furnishing, household equipment and routine maintenance increased from 3.2 to 4.1 percent in the period under consideration.

Additional differences can be observed regarding the price development. Price increase was more pronounced e.g. in alcoholic beverages, tobacco and narcotics and amounted to 46.8 percent relative to the Euro area. The share of these goods increased as well - from 5.8 to 7.5 percent. Furthermore, in contrast to Estonia, the price increase in the category clothing and footwear was below average in Latvia - the real exchange rate based on the index in this sector appreciated by only 13.6 percent.

The overall development of the components of HICP points toward more rapid price increase in the price of nontradables, which can be caused both by the

Balassa-Samuelson effect and the shift in consumption expenditure toward non-basic goods. The share of basic goods like food and non-alcoholic beverages as well as clothing and footwear declined and the share of non-basic goods and services contained in the categories telecommunication and recreational and cultural services increased in accordance with the explanation proposed by Bergstrand (1991). For the further investigation of the Balassa-Samuelson effect, the examination of productivity development is needed as pointed out earlier.

3.3.5 Lithuania

In Lithuania the overall real appreciation amounted to 46.0 percent in the time period 1996-2013 (Table 3.5). The shift in consumption expenditure has been more pronounced than in the case of either Estonia or Latvia. The share of food and nonalcoholic beverages shrank from 51.5 percent in 1996 to 25.3 percent in 2013 as did the share of clothing and footwear - from 10.2 to 6 percent. Consumption expenditure has shifted toward goods and services like those contained in the categories telecommunication, health, recreation and culture, education and restaurants and hotels. The shares of these categories increased substantially since 1996. Taken together, the goods and services listed above accounted for 8.1 percent of the representative consumption basket in 1996. Their share reached 23.2 percent in 2013. Therefore, as in the other transition economies, the approach proposed by Bergstrand (1991) can be used to explain part of the real appreciation in Lithuania.

The largest price increase relative to the Euro area at 82.7 percent has been, once again, recorded in the telecommunications sector, 82.7 percent. However, prices in housing increased sharply as well, by 71.0 percent since 1996. The price increase was, on the contrary, below average in furnishing and household equipment as well as in recreation and culture. In clothing and footwear, prices decreased as compared to the Euro area. In the category transport prices of fuels and transport services increased at an above average rate, while prices for purchases of vehicles declined relative to the Euro area. The real exchange rate based on the overall index for services appreciated by 56.4 percent, and therefore well above average.

Table 3.5: Development of HICP and weights in Lithuania, 1996 - 2013

HICP category	RER growth based on HICP prices in the category	Weight of category in % of total consumption expenditure	
	in %	1996	2013
Food and non-alcoholic beverages	-43.2	51.5	25.3
Alcoholic beverages, tobacco and narcotics	-42.7	6.2	8.9
Clothing and footwear	7.2	10.2	6.0
Housing, water, electricity, fuels	-71.0	15.4	13.2
Furnishing, household equipment and maintenance	-16.3	2.5	5.3
Health	-50.6	1.4	6.1
Transport	-52.5	4.2	13.4
Communication	-82.7	0.8	3.4
Recreation and culture	-32.9	2.8	5.2
Education	-52.2	0.3	1.7
Restaurants and hotels	-44.1	2.9	6.8
Miscellaneous goods and services	-37.2	1.7	4.6
Overall HICP	-46.0	100	100
Services	-56.4	10.5	25.1

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.

3.3.6 Hungary

The overall real appreciation in Hungary amounts to 33.7 percent since 1996 (Table 3.6). The HICP index for services is available since 2001, and the real exchange rate based on this index appreciated by 16.8 percent, which was slightly faster than the overall real exchange rate (14.4 percent since 2001). As in the case of the Czech Republic, and contrary to the other countries considered above, the share of services in the overall HICP increased only marginally - from 29.8 percent in 2001 to 33.1 percent in 2013. The shift of relative consumption expenditure since 1996 can be observed by means of the weights in the individual categories. The share of food and non-alcoholic beverages was already relatively low in 1996 and fell only by 5.5 percentage points - from 25.6 percent in 1996 to 20.1 percent in 2013. The decline was stronger in clothing and footwear - from 8.1 to 3.4 percent, and the price increase was relatively low. The real appreciation measured by the prices in this category amounts to 17.4 percent since 1996. As in the Czech Republic the

Table 3.6: Development of HICP and weights in Hungary, 1996 - 2013

HICP category	RER growth based on HICP prices in the category	Weight of category in % of total consumption expenditure	
	in %	1996	2013
Food and non-alcoholic beverages	-35.9	25.6	20.1
Alcoholic beverages, tobacco and narcotics	-37.4	6.9	7.8
Clothing and footwear	-17.4	8.1	3.4
Housing, water, electricity, fuels	-47.7	13.5	14.3
Furnishing, household equipment and maintenance	7.3	7.1	5.2
Health	-61.3	1.5	5.1
Transport	-24.5	13.3	15.6
Communication	-56.2	1.9	4.5
Recreation and culture	-27.5	9.1	7.5
Education	-32.8	0.3	1.6
Restaurants and hotels	-39.7	8.3	7.9
Miscellaneous goods and services	-24.6	4.4	6.9
Overall HICP	-33.7 / -14.4[1]	100	100
Services	-16.8[1]	29.8[2]	33.1

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.
1: since 2001, 2: in 2001

effect described by Bergstrand (1991) seems to have been weaker in Hungary, since transition started earlier than in other CEEC. The share of services in categories like recreation and culture and restaurants and hotels decreased since 1996. The relative price increase in the category restaurants and hotels was 39.7 percent and therefore above average. However, in recreation and culture the real appreciation amounted to 27.5 percent and was by 6.2 percent lower than that of the overall real exchange rate.

The highest real appreciation has been observed in the categories health, communication and housing. In communication, development of prices and share in the overall consumption basket has been similar as in the other countries. Prices increased by 56.2 percent compared to the Euro area and the share went up from 1.9 percent in 1996 to 4.5 percent in 2013. Calculated by the price development for health goods and services the real exchange rate appreciation since 1996 was

almost twice as high as the overall real appreciation. The share of health increased from 1.6 percent in 1996 to 5.1 percent in 2013. Most of the price increase took place before 2001, and detailed analysis is not possible due to lacking data. In 1999, e.g., patients taking prescription drugs faced a rapid price increases (Kovac 1999). Domestic manufacturers raised prices by 10.0 percent as government cut subsidies. The real appreciation since 2001 amounts to 24.0 percent and is caused mainly by an increase in prices for pharmaceutical products. In 2013, they account for 2.5 percent of the expenditure captured by the consumption basket, and the price relative to the Euro area is 33.9 percent higher than in 2001.

The share of housing remained almost unchanged and amounts to 14.3 percent of the expenditures contained in the consumption basket in 2013. The real exchange rate measured by price development in this category appreciated by 47.7 percent since 1996. In the period 2001-2013, for which detailed price data is available, the real appreciation amounted to 29.5 percent and was driven, to a large extent, by a gas price increase. Gas accounts for 4 percent of the expenditures contained in the consumption basket and its price relative to the Euro area is 45.0 percent higher in 2013 than in 2001. Data provided by the International Energy Agency (IEA) shows that natural gas has the highest share of total primary energy supply in Hungary (IEA 2011). The natural gas market was partially opened in 2004 and fully opened to competition in 2007. According to the IEA Hungary was the member country most seriously affected by the Gasprom-Ukraine conflict about gas pricing in 2006 (IEA 2007). It imports about 80.0 percent of its natural gas, mostly from Russia and uses the Ukraine pipeline as the prime import route. As 60 percent of the capacity of the pipeline was lost in the beginning of 2006, Hungary was not able to make up the supply lost from storage (IEA 2007). The new Law on Strategic Gas Reserves aimed at increasing underground storage capacity. The regulated gas price rose and the average gas price increased by almost 20 percent in eight months.

To sum up, the real appreciation in Hungary was driven to a lesser extent by a shift in relative demand. More important is the development of regulated prices and sectors.

3.3.7 Poland

In Poland, the overall real exchange rate appreciated by 22.0 percent since 1996 (Table 3.7). Real appreciation of services was substantially higher at 32.6 percent. The main driving force of relative price increase compared to the Euro area was the housing category. Consumption expenditure for housing, water, electricity and fuels accounts for more than one fifth of the overall consumption basket - only in Slovakia is the share higher. Not only is the share of housing in total consumption very high - it is also the category with the highest price increase relative to the Euro area. The real exchange rate measured by prices for housing, water, electricity and fuels appreciated by 38.0 percent since 1996, which is almost twice as fast as the overall real exchange rate. More than 10.0 percent of consumption expenditure is allotted to energy goods including electricity, gas and other fuels. The largest price hikes in this subcategory were experienced in electricity, at 45.9 percent and in gas, at 35.5 percent, relative to the Euro area. Demand for electricity grew since the mid-1990s (IEA 2011a). Yet, per-capita electricity demand is still about 60.0 percent of the OECD Europe average. In the tertiary sector of the economy, demand has especially increased above average. Electricity imports nearly tripled between 2000 and 2009, although Poland remains a net electricity exporter. Gas demand increased steadily since 2000 by rates similar to those of electricity demand. Gas tariffs are still regulated and tariffs are supposed to cover all the costs of gas supply (IEA 2011a). In spite of the price increase since 1996, natural gas prices for households in Poland remain low compared to other European countries. According to the IEA, Poland could have substantial amounts of unconventional gas, i.e. shale gas. However, a range of challenges regarding exploitation will postpone production to the 2020s at the earliest (IEA 2011a). If shale gas resources are confirmed, prices will experience rapid decline and therefore will weaken real appreciation in the future. To sum up, price increases in electricity and gas have been the result of positive demand shocks accompanying economic growth.

Another area with an above-average relative price increase is again communication. Real appreciation measured by the price index for this category amounted to 35.3 percent and the share in the representative consumption basket increased from 1.5 percent in 1996 to 3.2 percent in 2013. The price increase has been below average in the categories food and non-alcoholic beverages, alcoholic beverages, tobacco and narcotics and furnishing and household equipment. The real exchange rate

Table 3.7: Development of HICP and weights in Poland, 1996 - 2013

HICP category	RER growth based on HICP prices in the category	Weight of category in % of total consumption expenditure	
	in %	1996	2013
Food and non-alcoholic beverages	-16.9	34.4	20.1
Alcoholic beverages, tobacco and narcotics	-12.1	6.5	7.3
Clothing and footwear	56.8	7.4	4.3
Housing, water, electricity, fuels	-38.0	18.2	21.0
Furnishing, household equipment and maintenance	-10.9	4.8	4.9
Health	-26.4	3.7	5.0
Transport	-25.2	8.7	10.7
Communication	-35.3	1.5	3.2
Recreation and culture	-24.1	5.9	7.8
Education	-17.4	1.0	1.3
Restaurants and hotels	-23.5	2.5	3.2
Miscellaneous goods and services	-25.9	5.4	11.2
Overall HICP	-22.0	100	100
Services	-32.6	19.4	29.5

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.

based on prices of clothing and footwear depreciated sharply by 56.8 percent. The share of these basic goods and services has decreased substantially since 1996 in accordance with the explanation proposed by Bergstrand (1991). The share of recreation and culture and restaurants and hotels has increased between 1996 and 2013 and the price increase relative to the Euro area in these categories was slightly above average. Besides the approach by Bergstrand (1991), the relative increase in the prices of services can be the result of Balassa-Samuelson effects.

3.3.8 Romania

The real exchange rate appreciated in Romania by 52.2 percent between 1996 and 2013 (Table 3.8). Detailed data necessary to calculate the price index for services is available since 2001. However, most of the real appreciation took place before 2001. The overall real exchange rate appreciated only by 15.5 percent since 2001

TABLE 3.8: Development of HICP and weights in Romania, 1996 - 2013

HICP category	RER growth based on HICP prices in the category	Weight of category in % of total consumption expenditure	
	in %	1996	2013
Food and non-alcoholic beverages	-28.1	45.6	32.0
Alcoholic beverages, tobacco and narcotics	-69.2	4.6	6.4
Clothing and footwear	-33.6	13.7	5.0
Housing, water, electricity, fuels	-88.4	8.0	11.6
Furnishing, household equipment and maintenance	-13.6	7.3	5.1
Health	-43.9	1.5	7.4
Transport	-63.5	7.0	12.4
Communication	-100.9	1.0	6.5
Recreation and culture	-47.5	5.9	5.7
Education	-228.9	0.3	1.1
Restaurants and hotels	-76.3	3.2	2.8
Miscellaneous goods and services	-47.2	1.9	4.1
Overall HICP	-52.2 / -15.5[1]	100	100
Services	-12.8[1]	13.7[2]	23.4

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.
1: since 2001, 2: in 2001

and the rate of real appreciation in services was against all odds even lower, 12.8 percent. The share of services in overall consumption basket increased though, from 13.7 percent in 2001 to 23.4 percent in 2013.

As was the case in Bulgaria, the highest real appreciation since 1996 was observed in the category of education at 228.9 percent. The share of education increased at the same time from 0.3 to 1.1 percent. Furthermore, as in most of the other CEEC the category of communication has also experienced a rapid price increase in Romania. The real exchange rate based on the prices for communication goods and services appreciated by 100.9 percent and the share increased from 1.0 percent in 1996 to 6.5 percent in 2013. Other categories with above-average price increases are alcoholic beverages, tobacco and narcotics, housing, transport and restaurants and hotels. In alcoholic beverages, tobacco and narcotics prices jumped rapidly since 2001, by 49.1 percent compared to the Euro area. The price increase at 53.5 percent was most pronounced for tobacco products, the main reason being a hike

in excise duties. The real exchange rate calculated with the price index for housing, water, electricity, gas and other fuels appreciated by 49.0 percent since 2001. The most pronounced increase relative to the Euro area was in housing rentals at 95.2 percent. Furthermore, gas prices jumped by 65.7 percent relative to the Euro area average and contributed significantly to the overall price increase in this category. In restaurants and hotels as well as in transport the price increase took place mainly before 2001, so detailed analysis is not possible due to lacking data.

As in other CEEC, consumption expenditure shifted away from basic goods like food, clothing and furnishing and their respective price increases were well below average. The prices in the categories to which these goods belong also decreased compared to the Euro area. However, consumption expenditure shifted not toward services like those contained in the categories recreation and culture and restaurants and hotels, but rather to services from the area of health and transport, which can be considered as basic goods. Therefore, the descriptive analysis suggests low explanatory power of the approach proposed by Bergstrand (1991).

3.3.9 Slovenia

The lowest overall real appreciation was recorded in Slovenia at 11.5 percent since 1996 (Table 3.9). In the service sector, the relative price increase compared to the Euro area was more than twice the overall real appreciation since 2000. Again, prices rose rapidly in housing and communication while basic goods like food, clothing and furnishing experienced price increases below average and declining shares in the total consumption basket. The price development in recreation and culture points toward a strong Bergstrand-effect. The real appreciation calculated with the HICP in this category appreciated by 22.5 percent since 1996 and therefore almost twice as fast as the overall real exchange rate. The share in consumption increased from 6.6 percent in 1996 to 8.1 percent in 2013.

In most of the other categories, price development was as in the CEEC described above. Two important exceptions are the categories health and transport. The share of health expenditures increased from 0.7 percent in 1996 to 4.2 percent in 2013, and the share of out-patient services increased substantially since 2000. However, relative prices declined in this category as compared to the Euro area

Table 3.9: Development of HICP and weights in Slovenia, 1996 - 2013

HICP category	RER growth based on HICP prices in the category	Weight of category in % of total consumption expenditure	
	in %	1996	2013
Food and non-alcoholic beverages	-10.2	27.5	17.4
Alcoholic beverages, tobacco and narcotics	-18.5	3.1	6.0
Clothing and footwear	-8.2	9.2	6.2
Housing, water, electricity, fuels	-35.9	12.1	10.2
Furnishing, household equipment and maintenance	-5.4	8.0	6.2
Health	2.6	0.7	4.2
Transport	-1.0	15.8	17.6
Communication	-46.6	1.3	3.5
Recreation and culture	-22.5	6.6	8.1
Education	-13.5	0.8	1.6
Restaurants and hotels	-13.2	7.1	9.8
Miscellaneous goods and services	-9.3	7.8	9.0
Overall HICP	-11.5 / -7.3[1]	100	100
Services	-14.9[1]	26.8[2]	34.3

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.
1: since 2000, 2: in 2000

between 2000 and 2013. Medical and pharmaceutical services experienced a rapid price increase relative to the Euro area while the growth of prices of medical products, appliances and equipment was slower than the average in the other Euro area countries. In transport, compared to the Euro area almost all prices increased since 2000. Only purchases of vehicles became relatively less expensive, as in the other CEEC. However, a 75.3 percent relative price decline for motor cars produced a real depreciation calculated with the overall HICP in the transport sector by almost 10 percent since 2000.

Table 3.10: Development of HICP and weights in Slovakia, 1996 - 2013

HICP category	RER growth based on HICP prices in the category	Weight of category in % of total consumption expenditure	
	in %	1996	2013
Food and non-alcoholic beverages	-41.6	23.8	18.2
Alcoholic beverages, tobacco and narcotics	-45.8	5.8	5.4
Clothing and footwear	-42.9	13.2	4.7
Housing, water, electricity, fuels	-80.5	9.3	21.4
Furnishing, household equipment and maintenance	-16.3	12.5	7.0
Health	-64.3	0.8	4.8
Transport	-36.7	8.3	8.7
Communication	-85.1	0.6	3.9
Recreation and culture	-51.5	7.9	9.1
Education	-60.1	0.4	1.9
Restaurants and hotels	-52.3	12.5	6.6
Miscellaneous goods and services	-50.2	4.8	8.2
Overall HICP	-54.4	100	100
Services	-63.0	20.9	30.6

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.

3.3.10 Slovakia

The most pronounced overall real appreciation based on HICP has been recorded in Slovakia. Overall, RER appreciated by 54.4 percent since 1996, the rate being marginally higher in services at 63.0 percent (Table 3.10). Meanwhile, the share of services increased by almost 50.0 percent, from 20.9 in 1996 to 30.6 percent in 2013. The share of basic goods decreased while the price increase in the corresponding categories has been below average. However, household expenditures shifted mainly toward housing, water, electricity and fuels and to a lesser extent toward the categories health, communication and recreation and culture. The share of restaurants and hotels decreased from 12.5 percent in 1996 to 6.6 percent in 2013. Growing consumption expenditure for housing has been caused mainly by a sharp increases in prices for the goods and services contained in the housing category. The real exchange rate calculated with the HICP for housing appreciated by 80.5 percent. Only in communication has relative price increased faster

at 85.1 percent. Gas and electricity prices experienced an especially significant growth since 1996, by about 90.0 percent. As a consequence, their share in overall consumption has more than doubled, from 5.7 percent in 1996 to 13.9 percent in 2013, in spite of substantial efficiency gains in recent years. Thanks to the transfer of gas transit revenues, gas prices for households used to be the lowest in the region in the 1990s (IEA 2006). In 2003, gas prices were around USD 120/tcm and increased to 190/tcm in the last quarter of 2005 as a result of the indexation to oil prices (IEA 2006). Residential prices for electricity doubled between mid-2002 and mid-2004.

In the other categories, the price development is similar to the overall trend in CEEC. The relative price increase in services has been only slightly higher than the overall real appreciation and the shift toward other basic goods and services like fuels and electricity indicates that the magnitude of the Bergstrand-effect may be limited in Slovakia.

3.3.11 Summary of common trends

Table 3.11 summarizes the main findings of the detailed analysis of HICP based real exchange rates. The development of the single prices contained in the HICP points toward a significant magnitude of nontradables inflation which could be caused e.g. by the Balassa-Samuelson effect. The increase of relative prices was higher for services than for goods in most of the transition economies. Furthermore, the descriptive analysis of the data indicates that the argumentation provided by Bergstrand (1991) can be used as explanation for the real appreciation as well. Households have shifted their consumption expenditures toward new types of goods, like those contained in the category telecommunication, and have increasingly demanded goods and services from the area of recreation and culture. The weight of conventional basic goods like food and clothing has decreased substantially. Furthermore, the real appreciation was driven by a rapid increase of prices in the housing category. Especially in regard to fuels and in some countries to housing rentals, prices have increased since 1996.

TABLE 3.11: Key findings regarding the development of RER based on HICP (1996 - 2013)

	Growth of overall RER	Growth of RER based on HICP for services	Increase in the weight of services in total consumption expenditure
	in %	in %	percentage points
Bulgaria	-45.9	-68.8	23.0
Czech Republic	-38.2 / -29.3[2]	-37.1[2]	5.9[2]
Estonia	-35.1 / -27.6[1]	-36.2[1]	16.5[1]
Latvia	-34.9	-41.3	13.4
Lithuania	-46.0	-56.4	14.6
Hungary	-33.7 / -14.4[3]	-16.8[3]	3.3[3]
Poland	-22.0	-32.6	10.1
Romania	-52.2 / -15.5[3]	-12.8[3]	9.7[3]
Slovenia	-11.5 / -7.3[2]	-14.9[2]	7.5[2]
Slovakia	-54.4	-63.0	9.7

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.
1: since 1998; 2: since 2000; 3: since 2001.

3.4 Empirical Analyses

Before proceeding with the empirical investigation of the theoretical explanations, the next subsection examines the tradables/nontradables dichotomy. The ad hoc classification proposed here should shed light on the controversy regarding the magnitude of the Balassa-Samuelson effect in the transition economies.

3.4.1 Defining tradability

The tradables/nontradables dichotomy is a central starting point for many research topics such as the determination of inflation in open economies, the specification and estimation of international trade flows and the theory of real exchange rate determination (Goldstein and Officer 1979). Despite its significance to economic theory, there has been no empirical analysis regarding the distinction between tradable and nontradable goods for the case of the economies in transition. In the present section a short overview of the related literature regarding industrialized countries is presented and the main findings are applied to the case of the CEEC.

In accordance with the varying object of the different studies and the nature of the data used in these studies, diverse tradables/nontradables classifications have emerged in the literature (Dwyer 1992, Goldstein and Officer 1979). At one end of the spectrum the tradables sector consists of a narrow class of goods that enter into international trade (exports and imports) and satisfy the law of one price (e.g. Viner 1937). At the other end there is a broad class of goods that either earn or save foreign exchange (exports and import replacements) or could do so at a certain relative price. Aukrust (1970) defines as sheltered industries those whose products are left relatively free of foreign price competition (either because of the nature of the products or because of government protection). Goldstein and Officer (1979) apply three complementary criteria in their definition of the tradables and nontradables sector, namely the degree of foreign trade participation (it should be substantially higher for tradables), the cross-country correlation of price changes (it should be higher for tradables) and the degree of substitutability between domestic and traded goods from other countries (tradables should be closer substitutes for actually traded goods). In later analyses De Gregorio, Giovannini and Wolf (1994) and De Gregorio and Wolf (1994) propose rating a sector as tradable if exports amount to more than 10 percent of the production

value. According to their definition, the sector of tradable goods includes agriculture, mining, manufacturing and transportation services. All other products belong to the sector of nontradables. However, the main purpose of distinguishing between tradables and nontradables in the present analysis is to find industries in which the prices are largely driven by the conditions of world market competition. Using only the share of exports in production as a reference point does not allow room for industries with low production levels but high imports and thus high consumption or investment expenditures. More suitable criteria for the purpose of the empirical analysis of the real exchange rate are proposed by Dwyer (1992) and Knight and Johnson (1997), that is the degree of export orientation and the degree of import substitution. They define an industry as part of the tradables sector if the share of its total supply accounted for by exports and/or the percentage of demand accounted for by competing imports exceed 10.0 percent.

In accordance with the criteria of export orientation and import substitution/-substitutability the present chapter ascribes an industry to the tradables or nontradables sector of the economy using the degree of openness. The value of trade (imports plus exports) is divided by the value of the production of the industry. A certain problem arising from this methodology is the specification of the threshold value above which an industry should be defined as tradables. Given that the overall degree of openness (ODO) exceeds 100.0 percent in most of the CEEC, the previously used value of 10.0 percent of exports or imports relative to the production value seems to be an inadequate threshold for the sector in which the prices should be mainly driven by world market competition. Thus, in the present analysis the classification of the industries is carried out in a way that the degree of openness is much higher in the sector of tradables than in the sector of nontradables.[21]

Data about foreign trade is taken from the statistics database of the World Trade Organization and the United Nations and the production value data stems from Eurostat. The year 2004 is taken as reference partly because of data constraints and partly because in that year most of the transition-specific reforms should have been completed. Only industries with high private sector participation are considered. This leaves government-provided services including electricity, gas and water supply out of the analysis, since in many CEEC the latter had not yet been

[21] This criterion is similar to the first criterion in Goldstein and Officer (1979), namely the degree of foreign trade participation.

privatized. Their prices were highly regulated and cannot be considered as market-determined. Data constraints make it impossible to include the sector of financial services too. Table 3.12 shows the degree of openness of the main industries for which reliable data for the transition economies is available.[22]

Apart from the mining sector where the degree of openness is extremely high in some countries (the highest value is 27.49 in Lithuania), but relatively low in others (the lowest value has been found in Romania, 1.63), the highest tradability can be found in the sectors of travel, manufacturing and agriculture. In the travel sector the degree of openness ranges from 0.98 in Romania to 4.75 in Bulgaria, whereas in manufacturing the degree of openness is the highest in Estonia, 1.76, and the lowest in Poland, 0.79. The highest value for the sector of agriculture has been found in Estonia, 3.39. However, the lowest values are found to lie far below the overall degree of openness, namely in Romania at 0.22, and in Bulgaria at 0.52.

At the other end of the spectrum are the sectors of transportation and other services. The highest degree of openness in transportation has been found in the Slovak Republic, 0.93, and the lowest in the Czech Republic, 0.32. In other services the degree of openness is extremely low in Poland, 0.05, and the highest is in Hungary, 0.27.

The data points toward a fairly clear-cut distinction between the sector of tradables (mining, travel, manufactures) and the sector of nontradables (transport and other services). The sector of agriculture is the only exception. It will be left out of the following analysis, partly because of the large differences among the countries, and partly because of the nature of the price-setting mechanism: in many countries, the prices in agriculture have been highly regulated. The relative degree of openness defined as the degree of openness of the particular industry relative to the ODO confirms the classification above as well: the sector of transport and other services shows values relatively lower than in the other industries.

[22]The last row of the table provides a comparison to Germany as the main trading partner of most of the countries.

TABLE 3.12: Degree of openness of the main industries in 2004

	Agriculture (1)	Mining (2)	Manufactures (3)	Transport (4)	Travel (5)	Other services (6)	Overall
Bulgaria	0.52 (0.41)	4.12 (3.27)	0.94 (0.75)	0.55 (0.44)	4.75 (3.77)	0.13 (0.10)	1.26
Czech Republic	1.78 (1.27)	3.54 (2.53)	1.16 (0.83)	0.32 (0.23)	1.62 (1.16)	0.10 (0.07)	1.40
Estonia	3.39 (2.17)	5.19 (3.33)	1.76 (1.13)	0.62 (0.40)	3.29 (2.11)	0.18 (0.12)	1.56
Latvia	2.67 (2.57)	18.35 (17.64)	1.32 (1.27)	0.77 (0.74)	1.85 (1.78)	0.10 (0.10)	1.04
Lithuania	1.58 (1.42)	27.49 (27.77)	1.23 (1.11)	0.71 (0.64)	4.36 (3.93)	0.06 (0.05)	1.11
Hungary	0.89 (0.68)	15.99 (12.30)	1.30 (1.00)	0.38 (0.29)	3.42 (2.63)	0.27 (0.21)	1.30
Poland	0.79 (1.03)	1.91 (2.48)	0.79 (1.03)	0.32 (0.42)	2.66 (3.45)	0.05 (0.06)	0.77
Romania	0.22 (0.27)	1.63 (2.01)	1.10 (1.36)	0.45 (0.56)	0.98 (1.21)	0.11 (0.14)	0.81
Slovenia	1.64 (1.38)	12.14 (10.20)	1.27 (1.07)	0.47 (0.39)	2.36 (1.98)	0.11 (0.09)	1.19
Slovakia	1.43 (0.94)	20.44 (13.45)	1.46 (1.04)	0.93 (0.61)	4.26 (2.80)	0.20 (0.13)	1.52
Average	1.49 (1.22)	11.08 (9.20)	1.23 (1.05)	0.55 (0.47)	2.95 (2.48)	0.13 (0.11)	1.20
Classification		**Tradables**	**Tradables**	**Nontradables**	**Tradables**	**Nontradables**	
Germany	2.01 (2.79)	8.26 (11.47)	0.76 (1.06)	0.45 (0.63)	2.03 (2.82)	0.14 (0.19)	0.72

Source: Own calculations based on data by Eurostat and WTO.
(1) Agricultural products (including food and raw materials)
(2) Fuels and Mining Products (including ores and other minerals, fuels, non ferrous metals
(3) Manufactures (including iron and steel, chemicals, machinery and transport equipment,
textiles, clothing and other manufactures)
(4) Transport (including transportation services)
(5) Travel (including lodging, food and beverages, entertainment and transportation, gifts and souvenirs)
(6) Other commercial services (including communication, construction, business services, personal,
cultural and recreational services)

Degree of openness is defined as the ratio of trade value (exports+imports) to production value of the industry.
Overall degree of openness is defined as the ratio of overall trade value to GDP.
Values in parentheses represent degree of openness in the particular industry relative to overall degree of openness.
Source: Own calculations.
Disaggregated data about trade value is taken from WTO statistical database.
Data about overall trade value, GDP and production value is taken from Eurostat.

Given the data limitations, it would be optimistic to argue that the tradable/nontradable dichotomy shows a high degree of precision. This classification, however, explicitly accounts for specific characteristics and trade patterns of the CEEC and is, therefore, more suitable than previous ones for the empirical analysis of the real exchange rate movement in these countries. As stated above, especially the estimation of the Balassa-Samuelson effect is expected to gain accuracy by using this ad hoc classification in the calculation of the relative productivity. It will also be applied to the calculation of relative consumption expenditure and the two components of the real exchange rate.

The next section presents the dependent variables and a short overview of the variables representing potential explanations discussed in the theoretical part (see section 3.2) before proceeding to the results of the empirical analysis.

3.4.2 Decomposition of the real exchange rate

The tradable/nontradable classification derived in the preceding subsection can be used to describe the development of the relative prices of tradables to nontradables and the real exchange rate of the tradables sector. First, the overall real exchange rate is calculated from Eurostat data on the nominal Euro exchange rate and the overall HICP for the particular country and the Euro area as defined by equation (3.1). Furthermore, a second measure for the real exchange rate is obtained by replacing consumer prices with a GDP deflator for the transition economy under consideration on the one hand and for Germany on the other, since Euro area data is largely missing. The GDP deflator has been calculated for the main industries using Eurostat data on gross value added aggregates at current and constant prices from the NACE-21 classification. The price level in the tradables sector was obtained as the value-weighted average of the GDP deflators for Manufacturing, Mining and quarrying and Accommodation and food service activities (NACE B, C and I). The price level of nontradables is calculated accordingly from the GDP deflators for the following categories: Wholesale and retail trade; repair of motor vehicles and motorcycles, Transportation and storage, Information and communication, Professional, scientific and technical activities, Administrative and support service activities, Arts, entertainment and recreation and Other service activities

(NACE G, H, J, M, N).[23] The real exchange rate of tradables is calculated from the nominal Euro exchange rate and the price level for tradables in the transition economy and in Germany. Declining values indicate real appreciation as in the case of overall real exchange rate. The relative price of tradables to nontradables was obtained as the ratio of price level in the tradables sector to that in nontradables. In order to obtain the second term in equation (3.5)[24] the relative price was divided by the corresponding value for Germany. The theory on real exchange rate determination suggests that declining values of relative prices are the main cause of real appreciation as described in section 3.2.2. The two measures for the overall real exchange rate, the real exchange rate of the tradables sector and the price of tradables to nontradables relative to Germany represent further dependent variables for the empirical analysis, besides overall RER calculated with HICP or the GDP deflator. All four time series are represented as indices with base year 2005.

Figures 3.3 and 3.4 depict the development of the components of real exchange rates in transition economies since 1995. The growth rates over the period 1996-2012 are summarized in Table 3.13.[25] One important difference between the real exchange rates based on HICP and the GDP deflator refers to the bundle of goods and services captured by the indices. As pointed out earlier, HICP covers all consumption goods with weight in total consumption larger than $\frac{1}{1000}$. Therefore, the development of prices for imported consumption goods is captured by HICP. GDP deflator on the contrary covers all goods produced by the corresponding economy. It includes prices of domestically produced export goods, but excludes imported goods, both for consumption and investment purposes. This conceptual difference should be kept in mind when analyzing the development of the real exchange rate calculated with these indices.

[23] This list includes therefore all non-government services except for financial services, since trade data about financial services is not available and tradability in this sector could not be investigated.

[24] See p. 52.

[25] The growth rates reported in Table 3.14 refer to the time period 1996-2012 (if not otherwise specified) since data on the GDP deflators for 2013 are still not available at the time of the present research.

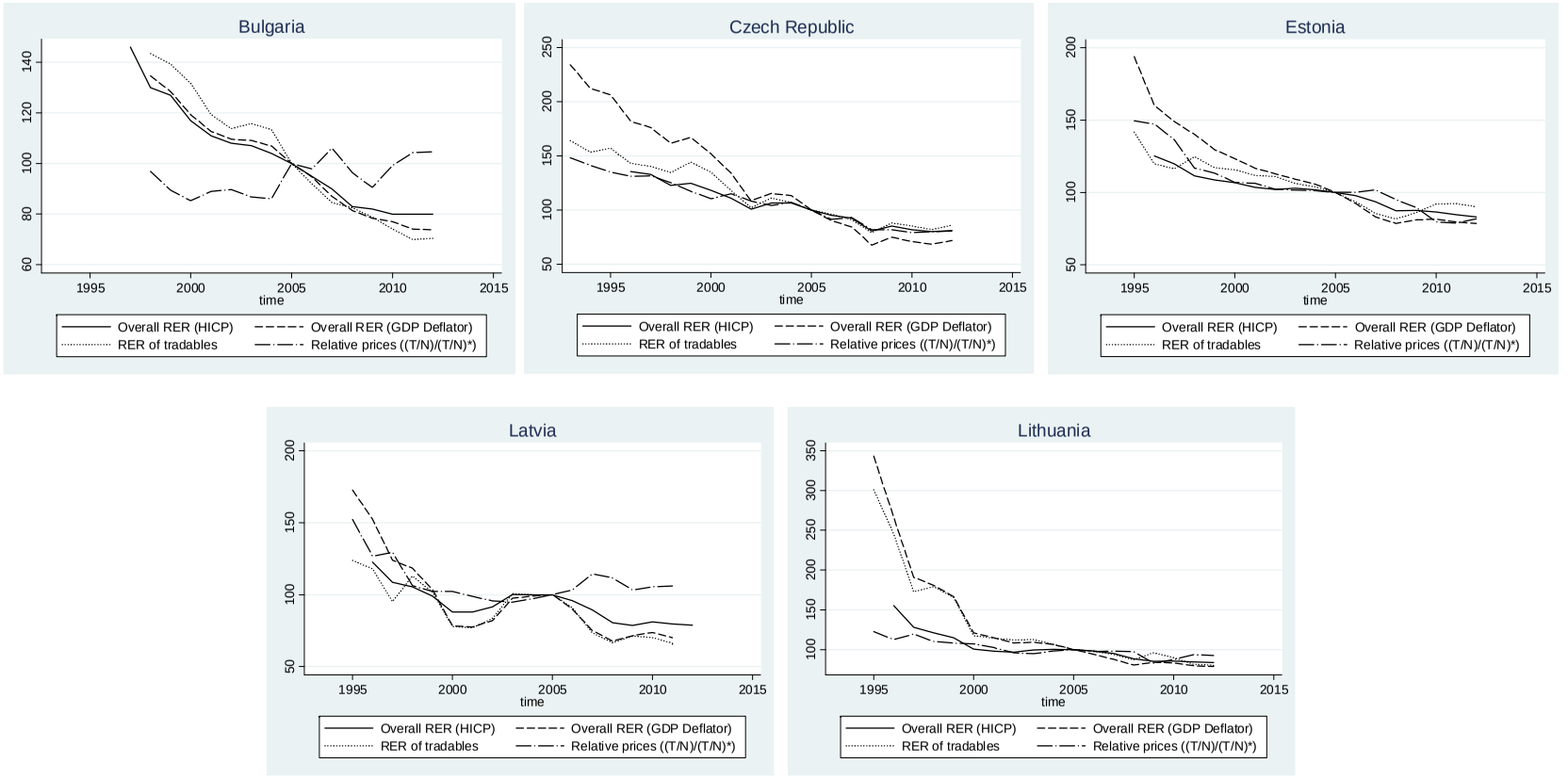


FIGURE 3.3: Decomposed movements of the real exchange rate in CEEC (1)

Tradables: Manufacturing, Mining and quarrying and Accommodation and food service activities (NACE B, C and I); Nontradables: Wholesale and retail trade; repair of motor vehicles and motorcycles, Transportation and storage, Information and communication, Professional, scientific and technical activities, Administrative and support service activities, Arts, entertainment and recreation and Other service activities (NACE G, H, J, M, N); Calculation based on HICP; 2005=100; Nominal exchange rate: price of Euro in LCU; Source: Own calculation based on data from Eurostat

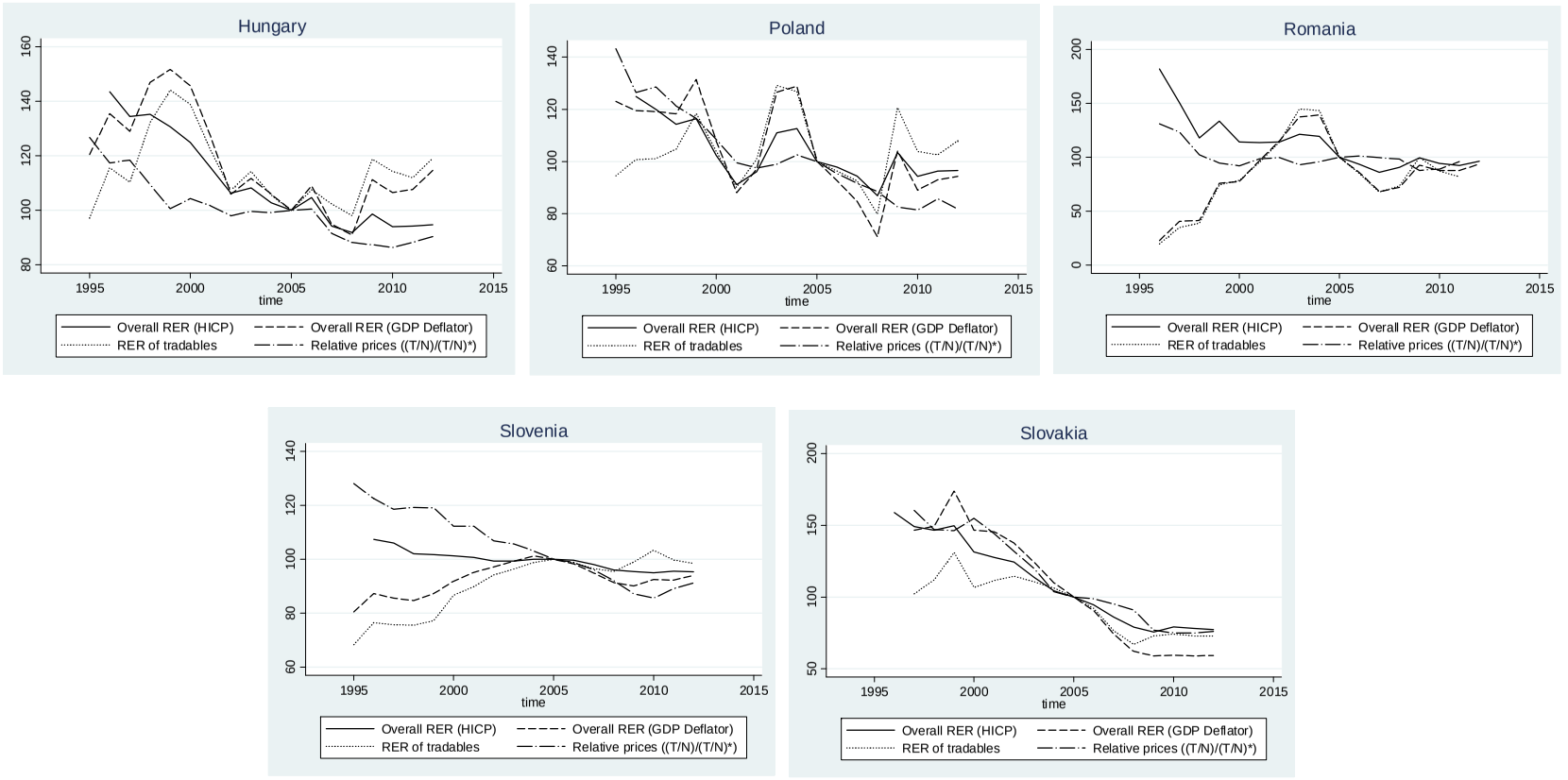


FIGURE 3.4: Decomposed movements of the real exchange rate in CEEC (2)

Tradables: Manufacturing, Mining and quarrying and Accommodation and food service activities (NACE B, C and I); Nontradables: Wholesale and retail trade; repair of motor vehicles and motorcycles, Transportation and storage, Information and communication, Professional, scientific and technical activities, Administrative and support service activities, Arts, entertainment and recreation and Other service activities (NACE G, H, J, M, N); Calculation based on HICP; 2005=100; Nominal exchange rate: price of Euro in LCU; Source: Own calculation based on data from Eurostat

TABLE 3.13: Growth of RER and its main components (1996 - 2012)

	Growth of overall RER based on HICP	Growth of overall RER based on the GDP deflator	Growth of RER in the tradables sector	Growth of relative prices (T/N)/(T*/N*)
	in %	in %	in %	in %
Bulgaria[1]	-38.5	-45.2	-50.9	8.0
Czech Republic	-40.1	-60.5	-39.9	-38.6
Estonia[2]	-33.5	-50.9	-24.7	-44.5
Latvia	-35.1	-54.1	-43.8	-16.4
Lithuania	-46.1	-70.5	-67.3	-17.9
Hungary	-34.0	-15.3	3.1	-23.1
Poland	-22.7	-21.1	7.2	-35.3
Romania[2]	-49.3	282.5	314.5	-26.8
Slovenia	-11.2	7.7	28.7	-25.6
Slovakia[3]	-48.1	-59.6	-28.7	-52.7

Source: Own calculations based on data by Eurostat.
Negative growth of real exchange rates corresponds to real appreciation.
1: 1998-2012; 2: 1996-2011; 3: 1997-2012.

Besides some differences in the variability of RER based on HICP and GDP deflator, both series exhibit similar trends in most of the countries. Notable exceptions are Slovenia and Romania, where RER based on HICP appreciated since 1995 but RER based on GDP deflator depreciated until 2004. The development of RER based on GDP deflator was largely driven by nominal exchange rate changes. Both the Slovenian Tolar and the Romanian Leu experienced steady nominal depreciation until 2004 which outpaced the price increase of the overall domestic production. In the other countries the overall trend indicates a real appreciation, independent of the price index used for the calculation of the real exchange rates.

The real exchange rate appreciation of the tradables sector has outpaced the increase in prices of nontradables relative to tradables in Bulgaria, the Czech Republic, Latvia and Lithuania (see Table 3.13). In Bulgaria, real appreciation in the tradables sector was even higher than the overall real appreciation and compensated for decreasing prices of nontradables relative to tradables. In Hungary, Poland, Romania, Slovenia and Slovakia, on the contrary, real appreciation was mainly driven by the adjustment of relative prices.

To sum up, the decomposition of the real exchange rate indicates that driving forces of tradables prices like quality improvements or trade liberalization have influenced the overall real exchange rate. However, the conventional approaches explaining overall real appreciation by internal real exchange rate changes driven by improvement in relative productivity of tradables or shifts of total demand should be investigated as well. They are expected to be driving forces of real appreciation long after the process of transition is fully completed since they are the result of the real convergence process.

3.4.3 Data: explanatory variables

3.4.3.1 Harrod-Balassa-Samuelson effect

The presence of productivity-driven real appreciation is examined in the present analysis using Eurostat data on gross value added at constant prices as well as employment statistics from the NACE-21 classification. Labor productivity is calculated as the ratio of gross value added to the number of employees in the particular industry.[26] The same NACE subgroups were aggregated to obtain the tradables and nontradables productivity as in the case of tradables and nontradables prices.[27]

Growth of productivity in both sectors is shown in Figure 3.5 for the period 2000-2011.[28] In all transition economies, productivity has grown more rapidly in the tradables than in the nontradables sector. Slovakia especially has experienced a rapid increase in tradables productivity, at 151.0 percent, during the time period 2000-2011, whereas productivity growth in the production of nontradables was as low as 18 percent. In Romania, on the contrary, productivity increase in tradables and nontradables sector was of similar magnitude, 80 percent and 68 percent, respectively.

[26] A more accurate measure of labor productivity would be productivity per hour worked instead of productivity per employee. However, due to lack of data the number of employees is used in the present analysis.

[27] See p. 91.

[28] The data set covers the time span 1993-2012. However, 2000-2011 is the time period, for which data for most of the country is available. Only in Poland does the time series begin later, in 2004.

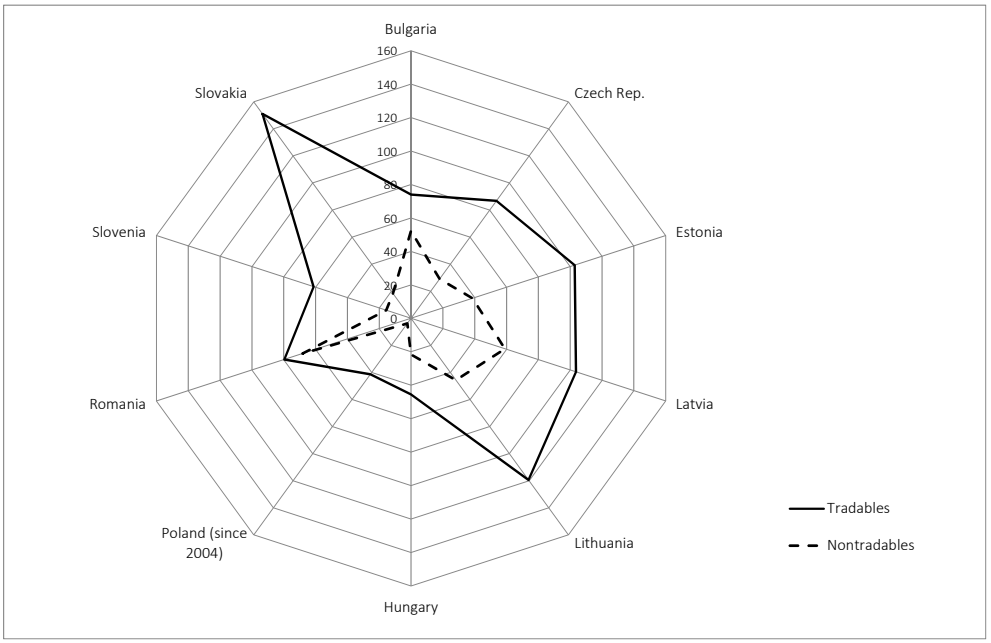


FIGURE 3.5: Productivity growth in the tradables and nontradables sector in CEEC (2000-2011) in percent

Productivity is defined as the ratio of gross value added at constant prices to the number of employees.
Source: Own calculation based on Eurostat data.

In the next step, relative productivity was calculated as the ratio of productivity in the tradables sector to that of nontradables. Figure 3.6 depicts the development of relative productivity since 1993. As illustrated in Figure 3.5, productivity of tradables relative to nontradables has grown most rapidly in Slovakia. In most of the countries the increase of relative productivity in the 1990s was only modest. Especially at the beginning of transition, this outcome is not surprising, since most of the services were provided by the state sector during the socialist regime (Nenova 2004). The emergence and further development of the private service sector has been favored since the beginning of the transition process. Therefore, there has been high potential in the countries in transition for fast growth in productivity both in the tradables and nontradables sector. Besides the failure of the PPP in the external sector, productivity development in the nontradables sector is a second factor that could have led to a lower explanatory power of the Balassa-Samuelson effect in the early years of transition. A similar result is also reported by Nenovsky and Dimitrova (2002) for the case of Bulgaria.

The increase in relative productivity gained momentum between 2002 and 2008 as

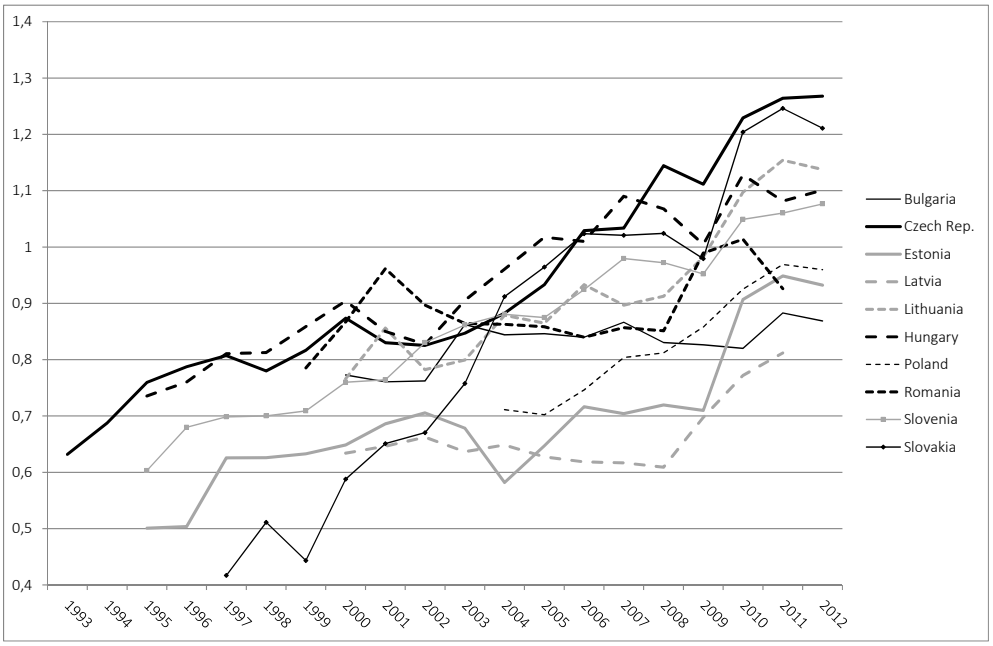


FIGURE 3.6: Productivity in the tradables relative to the nontradables sector in CEEC

Productivity is defined as the ratio of gross value added at constant prices to the number of employees.
Source: Own calculation based on Eurostat data.

the process of transition proceeded. Especially in Hungary and the Czech Republic, productivity growth in tradables relative to the nontradables sector accelerated since the early 2000s. In the Baltic countries, this was the case since the beginning of the economic crisis. In Bulgaria and Romania, on the contrary, relative productivity has remained relatively stable, since the transition process was largely postponed by the severe economic crisis in the 1990s.

The development of productivity in tradables relative to the nontradables sector divided by the corresponding value for Germany is depicted in Figure 3.7. This diagram confirms the results from Figure 3.6. The increase in relative productivity accelerated especially in the years prior to the economic crisis and during the economic crisis. The peak in 2009 is due to a sharp decrease in labor productivity in the tradables sector in Germany. It was the combination of a drop in value added and reduced working hours leaving the number of employees relatively stable.

Figure 3.7 shows that growth of relative productivity becomes less pronounced after accounting for productivity developments abroad. In the Baltic countries,

Romania and Bulgaria productivity of tradables to nontradables relative to Germany even decreased between 2002 and 2007. In Slovenia, Slovakia, Hungary and the Czech Republic, on the contrary, the trend of relative productivity remained positive even after accounting for productivity dynamics in Germany.

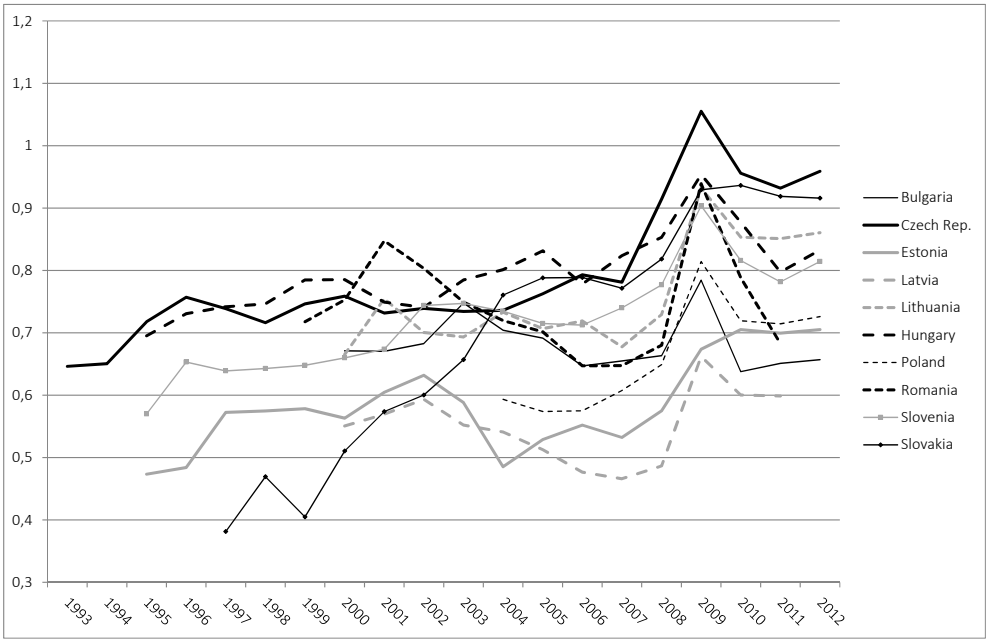


FIGURE 3.7: Productivity in the tradables to the nontradables sector in CEEC relative to Germany

Productivity is defined as the ratio of gross value added at constant prices to the number of employees.
Source: Own calculation based on Eurostat data.

The ratio of relative productivity in the transition economies to that in Germany will be used in the empirical analysis in order to investigate the impact of the Balassa-Samuelson effect. Germany will be used as reference country because it is an important trading partner for CEEC and furthermore the largest economy in the Euro area. If all assumptions apply as in the framework described in section 3.2.2., then the productivity variable should affect the overall real exchange rate via relative prices of tradables to nontradables. The expected sign is in both cases negative, since increasing relative productivity compared to Germany should lead to real appreciation via increasing prices of nontradables. The real exchange rate of the tradables sector should remain unaffected by the development of relative productivity. If, however, relative purchasing power parity does not hold in the tradables sector, it is possible to observe real depreciation in the tradables sector as a result of an increase in relative productivity. In the case it is significant, the expected sign of relative productivity with regard to the real exchange rate in the

tradables sector is therefore positive.

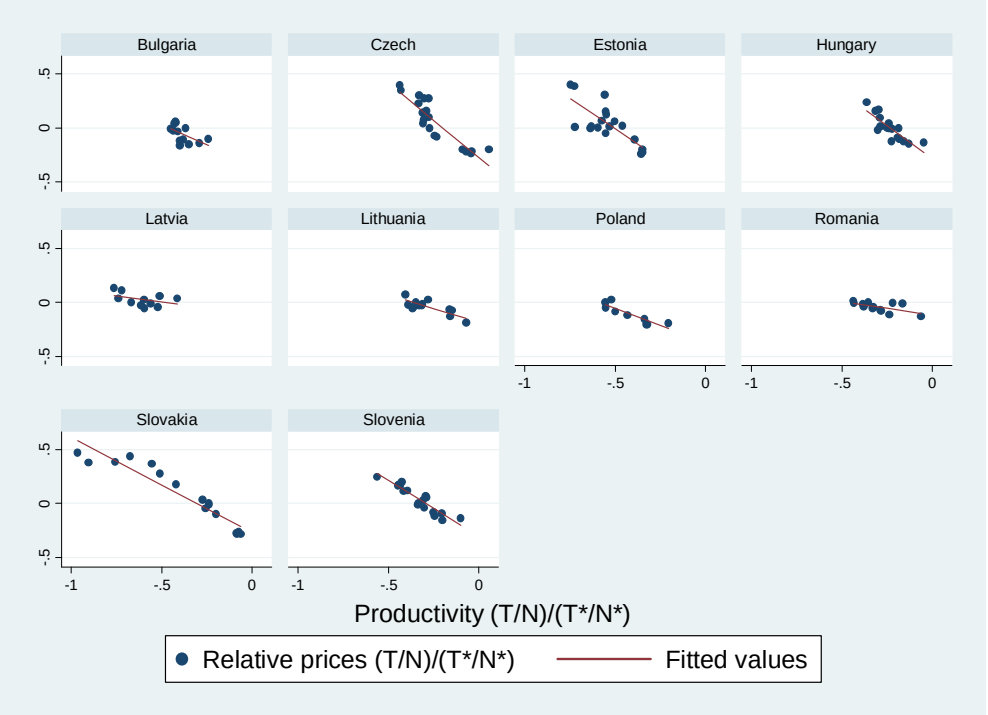


FIGURE 3.8: Productivity in tradables to nontradables sector relative to Germany (horizontal axis) and prices of tradables relative to notradables (vertical axis) in CEEC (logs)

Productivity is defined as the ratio of gross value added at constant prices to the number of employees; Relative prices based on the GDP deflator;
Source: Own calculation based on Eurostat data.

In Figure 3.8 productivity in tradables relative to nontradables (relative to Germany) is plotted against relative prices of tradables to nontradables since productivity is expected to affect the overall real exchange rate over the internal real exchange rate, i.e. the relative prices. The regression lines suggest negative relationship in all ten countries: increasing productivity in tradables relative to nontradables is associated with decreasing prices of tradables relative to notradables. The highest correlation is observed in Slovenia, -0.93 and Slovakia, -0.95.

3.4.3.2 Shift in private consumption

In the style of Bergstrand (1991), real appreciation can be further produced by a shift of private consumption from basic to luxury goods. Bergstrand assumes that, contrary to basic goods, luxury goods are mostly nontradables. According to Bergstrand rising income increases demand for nontradables relative to tradables

since luxury products (basic goods) exhibit income elasticity higher (lower) than one. The result is an increase in the prices of nontradables relative to tradables and overall real exchange rate appreciation.[29]

In the present section assumptions underlying the Bergstrand model are examined in the context of CEEC. First, income elasticity of different categories of consumption goods and services is analyzed thereby identifying luxury and basic products consumed by households. Second, the pattern of consumption expenditure is analyzed. The pattern of consumption of nontradables relative to tradables is investigated, since Bergstrand proposes that real appreciation is caused by a shift of consumption from tradables to nontradables. Furthermore, consumption of luxury goods and services relative to basic goods and services is plotted and it is shown that the pattern is different from that of nontradables consumption relative to tradables.

For the identification of luxury and basic goods, disaggregated annual data on final consumption expenditure of households by consumption purpose is taken from Eurostat. The analysis is performed for 47 subcategories from the COICOP classification (see Table 3.14). The data is at constant prices and covers the time span 1990-2012. Income elasticities for the different categories are calculated using panel regression of consumption expenditure on GDP per capita and consumer prices in the particular category. PPP adjusted real GDP per capita and consumer prices stem from Eurostat as well. All variables are expressed as logarithms. Nonstationarity of the time series is examined using the Im-Pesaran-Shin test for unbalanced panels. The starting point of this test is a set of Dickey-Fuller regressions, one for each panel (Im, Pesaran and Shin 2003). In the second step, the average of the resulting t statistics is computed and the null hypothesis is tested that all panels contain a unit root. The IPS test allows for heterogeneous panels and does not require balanced datasets. However, there cannot be gaps in the panel when using the IPS test.

As Table 3.14 indicates, most of the variables turned out to be I(1), thus the regressions are performed in first differences. The Hausman test is used to evaluate the appropriateness of country fixed effects. In the majority of the COICOP the Hausman test showed no significant difference between the fixed and the random

[29] See section 3.2.1.2.

TABLE 3.14: Unit root tests of prices, consumption and income

COICOP	Category	$Z_{\tilde{t}-bar}$			
		Consumption	Δ Consumption	Price	Δ Price
Food and non-alcoholic beverages					
c011	Food	-.820	-4.04***	2.14	-6.43***
c012	Non-alcoholic beverages	-.659	-3.32***	2.22	-6.89***
Alcoholic beverages, tobacco and narcotics					
c021	Alcoholic beverages	1.74	-4.83***	-.275	-5.85***
c022	Tobacco	-.325	-4.42***	1.53	-5.80***
c023	Narcotics	-.081	-3.69***	2.08	-5.18***
Clothing and footwear					
c031	Clothing	2.60	-4.79***	-3.76***	-5.90***
c032	Footwear including repair	3.10	-4.09***	-3.25***	-6.21***
Housing, water, electricity, gas and other fuels					
c041	Actual rentals for housing	.218	-5.10***	-3.13**	-5.02***
c042	Imputed rentals for housing	1.53	-3.95***	-.622	-4.43***
c043	Maintenance and repair of the dwelling	-.298	-3.84***	-1.67**	-5.95***
c044	Water supply and miscellaneous services relating to the dwelling	-.002	-5.91***	1.86**	-4.71***
c045	Electricity, gas and other fuels	-2.38***	-6.68***	-1.06	-5.38***
Furnishings, household equipment and routine household maintenance					
c051	Furniture and furnishings, carpets and other floor coverings	1.44	-3.87***	-3.24***	-5.52***
c052	Household textiles	-.370	-4.45***	-3.23***	-6.22***
c053	Household appliances	.696	-3.91***	-2.84***	-6.14***
c054	Glassware, tableware and household utensils	.320	-5.25***	.273	-5.42***
c055	Tools and equipment for house and garden	1.67	-5.92***	-1.63*	-5.81***
c056	Goods and services for routine household maintenance	.165	-5.22***	-.758	-6.43***
Health					
c061	Medical products, appliances and equipment	-.106	-6.19***	-1.06	-6.29***
c062	Out-patient services	-3.06***	-6.48***	.963	-6.01***
c063	Hospital services	-1.93**	-5.59***	.260	-5.53***
Transport					
c071	Purchase of vehicles	.784	-5.31***	-1.94**	-6.08***
c072	Operation of personal transport equipment (incl. fuels)	-.551	-5.28***	1.65	-6.64***
c073	Transport services	-2.82***	-5.03***	.792	-6.89***
Communication					
c081	Postal services	-1.12	-6.46***	.575	-6.64***
c082	Telephone and telefax equipment and services	1.73	-5.32***	4.50	-4.46***
c083	Telephone and telefax services	.993	-4.08***	-4.17***	-4.87***
Recreation and culture					
c091	Audio-visual, photographic and information processing equipment	2.58	-5.40***	5.26	-5.45***
c092	Other major durables for recreation and culture	-1.68**	-6.22***	-3.94***	-6.07***
c093	Other recreational items and equipment, gardens and pets	1.61	-4.58***	-2.26**	-6.37***
c094	Recreational and cultural services	-2.25**	-5.11***	-1.07	-5.44***
c095	Newspapers, books and stationery	-1.14	-4.87***	-.308	-5.47***
c096	Package holidays	-1.15	-6.30***	-.188	-5.47***
Education					
c101	Pre-primary and primary education	-3.25***	-6.26***	-.115	-5.63***
c102	Secondary education	.424	-5.60***	-.828	-4.23***
c103	Post-secondary non-tertiary education	-.484	-4.90***	-1.61*	-3.55***
c104	Tertiary education	.395	-6.11***	-.447	-4.76***
c105	Education not definable by level	.160	-5.22***	-.980	-4.70***
Restaurants and hotels					
c111	Catering services	-1.41*	-5.64***	-.481	-5.73***
c112	Accommodation services	-1.33*	-6.20***	-1.48*	-5.42***
Miscellaneous goods and services					
c121	Personal care	.400	-4.98***	-1.70**	-6.09***
c122	Prostitution	-.905	-3.55***	1.80	-3.82***
c123	Personal effects n.e.c.	-.174	-4.85***	1.88	-5.99***
c124	Social protection	2.41	-5.54***	.222	-6.05***
c125	Insurance	-1.74**	-6.35***	-.681	-5.86***
c126	Financial services n.e.c.	-.788	-6.95***	-.380	-6.71***
c127	Other services n.e.c.	-.516	-6.42***	-.989	-5.91***
	Income per capita	GDP	Δ GDP		
		.255	-4.38***		

Im-Pesaran-Shin test with H0: all panel contain a unit root;
*/**/*** significant at 10%/5%/1%;
Source: Own calculations based on data by Eurostat.

effect coefficients. Therefore, the coefficients of the (more efficient) random effects model are reported if not otherwise specified. In the next step, a one-sided z-test[30] is employed to evaluate if the estimated income elasticity in the particular category exceeds one, i.e. if the category comprises mainly luxury goods. Reported p-values refer to the H_0 of elasticity$\leq$1. If H_0 cannot be rejected the alternative test is applied to investigate if elasticity is significantly lower than one as should be the case for basic goods.

The results of the empirical analysis are reported in Table 3.15. Income elasticity varies between 0.13 for social protection and 3.13 for other major durables from the area of recreation and culture, including durables for indoor and outdoor recreation and musical instruments. As expected, income elasticity is low with regard to conventional basic goods and services like food, medical products, water supply and electricity, gas and other fuels. However, contrary to the proposition by Bergstrand (1991), high income elasticity is not found to prevail in services like recreational and cultural services but rather in tradable goods like vehicles, household textiles and appliances, telephone and telefax equipment and services, audio-visual, photographic and information processing equipment. Postestimation one-sided tests indicate that (among other categories) these goods can be referred to as luxury goods whereas basic goods are, among others, household services, food and social protection.

The results of these empirical analyses indicate that one crucial assumption of the model proposed by Bergstrand is not fulfilled in the case of CEEC. Contrary to the assumption made by Bergstrand, luxury goods are mainly tradables in transition economies. It is still true that with higher income private consumption shifts toward new goods and services. However, consumption expenditures shift away from basic goods like household services, food and telephone and telefax services toward mostly tradable goods like audio-visual technique, household appliances and road vehicles, since their income elasticity exceeds one.

Figure 3.9 shows the development of nontradables consumption relative to tradables compared to Germany. In most of the transition economies, relative consumption of nontradables to tradables has been decreasing since the mid 1990s.

[30] t-test for the categories where fixed effects are more appropriate.

TABLE 3.15: Classification of private consumption in luxury and basic goods

COICOP	Category	Income elasticity	p-value	Classification
Food and non-alcoholic beverages				
c011	Food	.65	1.000	Basic
c012	Non-alcoholic beverages	1.30	.067	Luxury
Alcoholic beverages, tobacco and narcotics				
c021	Alcoholic beverages	.53*	.997	Basic
c022	Tobacco	.79	.893	
c023	Narcotics	.26	1.000	Basic
Clothing and footwear				
c031	Clothing	.98	.522	
c032	Footwear including repair	1.18	.264	
Housing, water, electricity, gas and other fuels				
c041	Actual rentals for housing	.87	.622	
c042	Imputed rentals for housing	.14	1.000	Basic
c043	Maintenance and repair of the dwelling	1.52	.150	
c044	Water supply and miscellaneous services relating to the dwelling	.52*	.998	Basic
c045	Electricity, gas and other fuels	.39	.961	Basic
Furnishings, household equipment and routine household maintenance				
c051	Furniture and furnishings, carpets and other floor coverings	1.13	.311	
c052	Household textiles	2.50	.058	Luxury
c053	Household appliances	1.71	.002	Luxury
c054	Glassware, tableware and household utensils	1.45	.010	Luxury
c055	Tools and equipment for house and garden	1.22	.291	
c056	Goods and services for routine household maintenance	.97	.610	
Health				
c061	Medical products, appliances and equipment	.74*	.911	Basic
c062	Out-patient services	.98	.528	
c063	Hospital services	1.41	.204	
Transport				
c071	Purchase of vehicles	2.28	.001	Luxury
c072	Operation of personal transport equipment (incl. fuels)	.92	.871	
c073	Transport services	1.08	.320	
Communication				
c081	Postal services	.80	.599	
c082	Telephone and telefax equipment and services	2.53	.020	Luxury
c083	Telephone and telefax services	.28	.952	Basic
Recreation and culture				
c091	Audio-visual, photographic and information processing equipment	1.41*	.029	Luxury
c092	Other major durables for recreation and culture	3.13	.046	Luxury
c093	Other recreational items and equipment, gardens and pets	.91	.714	
c094	Recreational and cultural services	.83	.630	
c095	Newspapers, books and stationery	.91*	.741	
c096	Package holidays	1.45*	.084	Luxury
Education				
c101	Pre-primary and primary education	.95	.648	
c102	Secondary education	1.99	.217	
c103	Post-secondary non-tertiary education	2.00	.000	Luxury
c104	Tertiary education	1.24	.130	
c105	Education not definable by level	1.33	.341	
Restaurants and hotels				
c111	Catering services	1.06	.384	
c112	Accommodation services	1.15	.292	Luxury
Miscellaneous goods and services				
c121	Personal care	1.03	.446	
c122	Prostitution	.49	.958	Basic
c123	Personal effects n.e.c.	1.66	.016	Luxury
c124	Social protection	.13	.998	Basic
c125	Insurance	2.72	.013	Luxury
c126	Financial services n.e.c.	1.60	.192	
c127	Other services n.e.c.	1.22	.351	

Source: Own calculations based on data by Eurostat.
Income elasticity in CEEC from random effects panel analysis 1990-2013 if not otherwise specified; p-value of one-sided z-test calculated from the Wald χ^2 statistic;
*Fixed-effects regression; p-value of one-sided t-test calculated from the Wald F statistic.

The pace of increasing tradables consumption relative to nontradables has decelerated during the current economic crisis, thus confirming the results that luxury goods are mostly tradables. Furthermore, consumption of nontradables relative to tradables increased in Bulgaria during the severe economic crisis in 1996-1997.

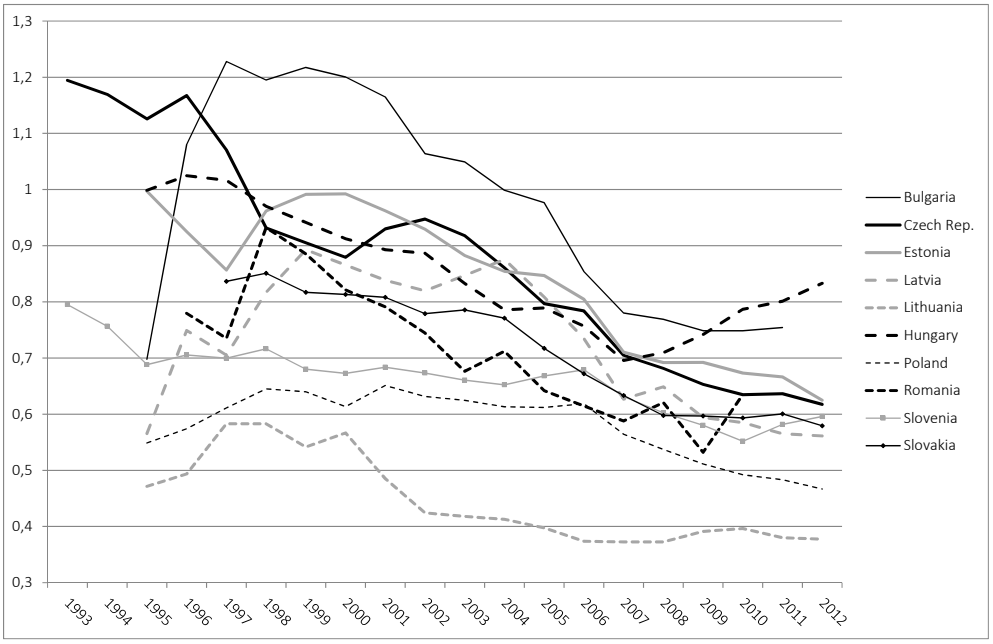


FIGURE 3.9: Private consumption of nontradable goods and services relative to tradables in CEEC relative to Germany

Source: Own calculation based on Eurostat data.

Private consumption of nontradable goods and services relative to tradables (compared to Germany) is plotted against prices of tradables relative to nontradables in Figure 3.10. According to the model proposed by Bergstrand (1991) higher consumption of nontradables relative to tradables should be associated with decreasing prices of tradables relative to nontradables. The relationship between these two variables shown in Figure 3.10 is, however, positive in most of the countries. Although the statistical properties of these analysis are rather weak, it is affirmative for the hypothesis that private consumption has shifted away from nontradables toward tradable goods and services. The exact relationship will be tested in the empirical model at the end of the present section.

This analysis demonstrates that increasing prices of nontradables relative to tradables are not the result of a shift in private consumption demand toward nontradables as proposed by Bergstrand (1991). Earlier studies have indeed confirmed

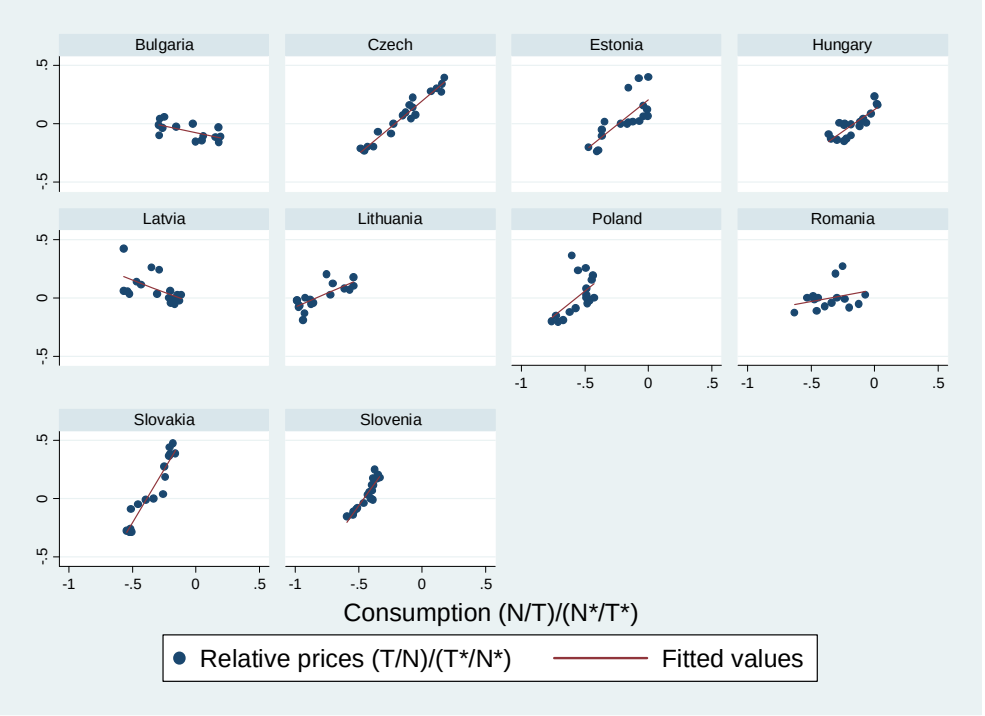


FIGURE 3.10: Private consumption of nontradable goods and services relative to tradables (relative to Germany, horizontal axis) and prices of tradables relative to nontradables (vertical axis) in CEEC (logs)

Relative prices based on the GDP deflator; Source: Own calculation based on Eurostat data.

the effect of a private consumption increase on the real exchange rate.[31] However, income growth has shifted private consumption toward tradable goods. Therefore, in the case that purchasing power parity is not fulfilled in the sector of tradables, it is possible to observe an increase of tradables prices and real appreciation via the real exchange rate of the tradables sector.

Figure 3.11 depicts the consumption of luxury goods relative to that of basic goods, again compared to Germany. In most of the countries relative consumption of luxury to basic goods and services increased in the time period 1998-2009 and dropped as a result of income decrease in the beginning of the economic crisis. Relative consumption has increased again since 2009, especially in the Baltic countries where the recovery from the economic crisis has been relatively prompt. Relative consumption is still declining in Slovenia where GDP growth was negative until the third quarter of 2013.

[31] See e.g. Boeva (2009).

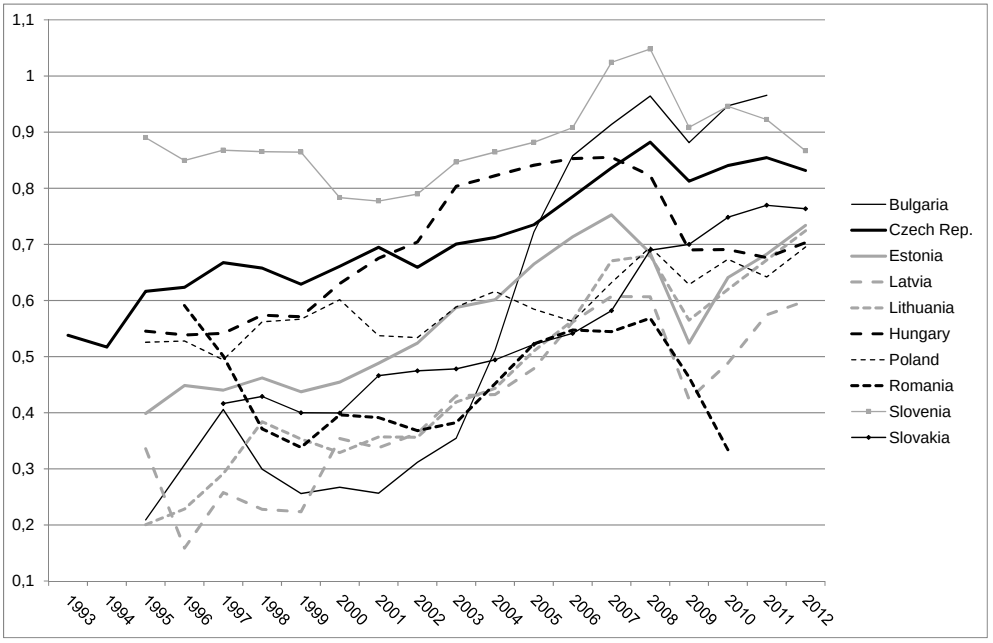


FIGURE 3.11: Private consumption of luxury goods and services relative to basic goods and services in CEEC relative to Germany

Source: Own calculation based on Eurostat data.

Figure 3.12 plots private consumption of luxury goods and services relative to basic goods and services against the real exchange rates of the tradables sector. The graphical analysis shows that higher values of relative consumption are associated with real appreciation in the tradables sector in almost all countries. The relationship is especially pronounced in Slovakia, Czech Republic, Latvia and Lithuania.

In Figure 3.13 private consumption of luxury goods and services relative to basic goods and services is plotted against the prices of tradables relative to nontradables. The positive relationship suggested by theory can be observed only in two countries. The negative correlation observed in the other countries is possibly the result of common cause interdependence.

In the empirical analyses of the driving forces of the real appreciation in transition economies both the relative consumption of nontradables to tradables and the relative consumption of luxury goods to basic goods will be taken into account. The correlation between these two variables is relatively low since not all goods and services could be classified in the particular categories. The expected sign of relative consumption of nontradables to tradables with respect to the overall real exchange rate is negative, if significant. With higher relative consumption of nontradables to tradables, relative prices of tradables to nontradables decrease

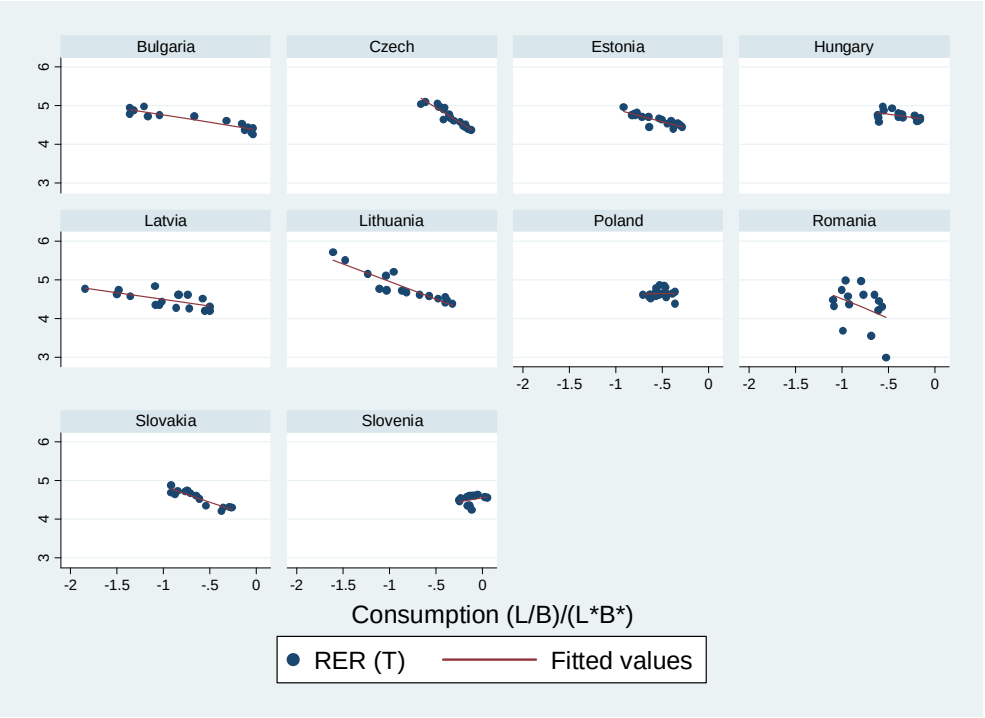


FIGURE 3.12: Private consumption of luxury goods and services relative to basic goods and services (relative to Germany, horizontal axis) and real exchange rates of the tradables sector (vertical axis) in CEEC (logs)

RER(T) based on the GDP deflator; Source: Own calculation based on Eurostat data.

and the currency appreciates in real terms. The expected sign of relative consumption of luxury goods to basic goods is negative as well. Increasing relative consumption leads to higher prices of tradables and therefore to appreciation of the real exchange rate in the tradables sector and the overall real exchange rate. With regard to the prices of tradables relative to nontradables the expected sign is positive, though.

3.4.3.3 Additional explanatory variables

The quality and reputation improvement of tradable goods is proxied by the gross inflows of FDI provided by Eurostat. Higher FDI is expected to lead to real appreciation via increasing price of tradables relative to abroad as a result of better quality, reputation and marketing measures. Furthermore, net capital inflows cause external real appreciation also by increasing demand for domestic goods. Therefore, the expected sign of the variable is negative with regard to the overall

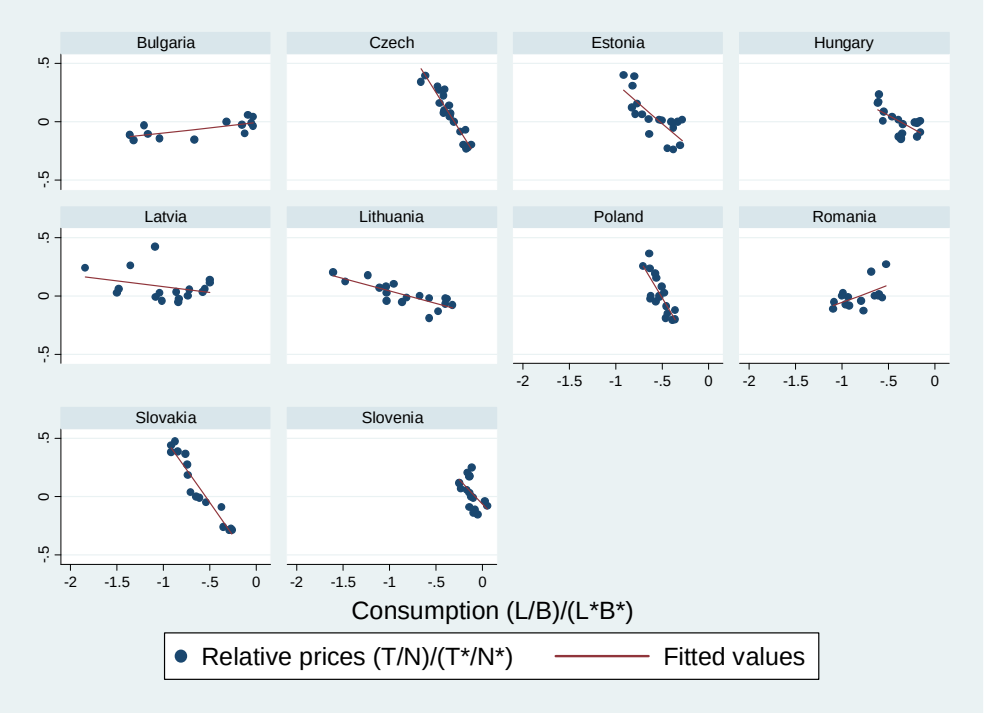


FIGURE 3.13: Private consumption of luxury goods and services relative to basic goods and services (relative to Germany, horizontal axis) and prices of tradables relative to nontradables (vertical axis) in CEEC (logs)

Relative prices based on the GDP deflator; Source: Own calculation based on Eurostat data.

real exchange rate and the real exchange rate of tradables.

Figure 3.14 depicts the development of gross FDI inflows to the CEEC since 1993. In the early 1990s FDI inflows were relatively low. They increased during the process of transition and reached their peak in most of the countries prior to the current economic crisis. A drop was observed in the early 2000s as well as during the economic crisis in 2009-2010. The largest aggregated FDI inflows were recorded in Bulgaria and Estonia, 9.2 and 8.1 percent of GDP since 1996, respectively.

In Figure 3.15 the values of FDI inflows are plotted against GDP deflator based external real exchange rate in CEEC. The diagram is in accordance with the hypothesis of negative relationship between FDI and external real exchange rates. Higher FDI inflows are associated with real appreciation in most of the countries.

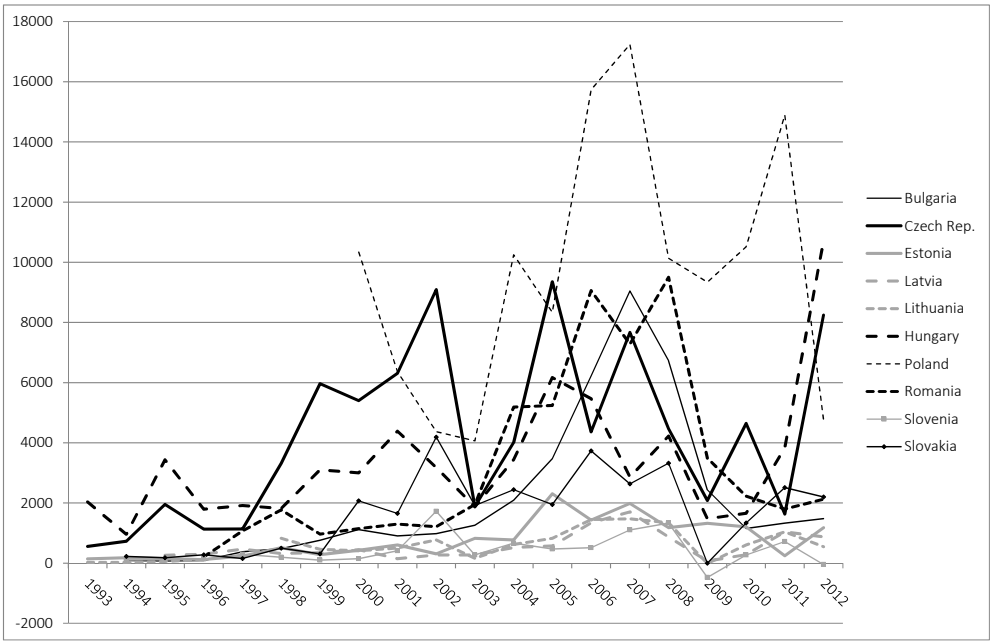


FIGURE 3.14: Foreign direct investment in CEEC

Gross inflows in million Euro; Source: Eurostat.

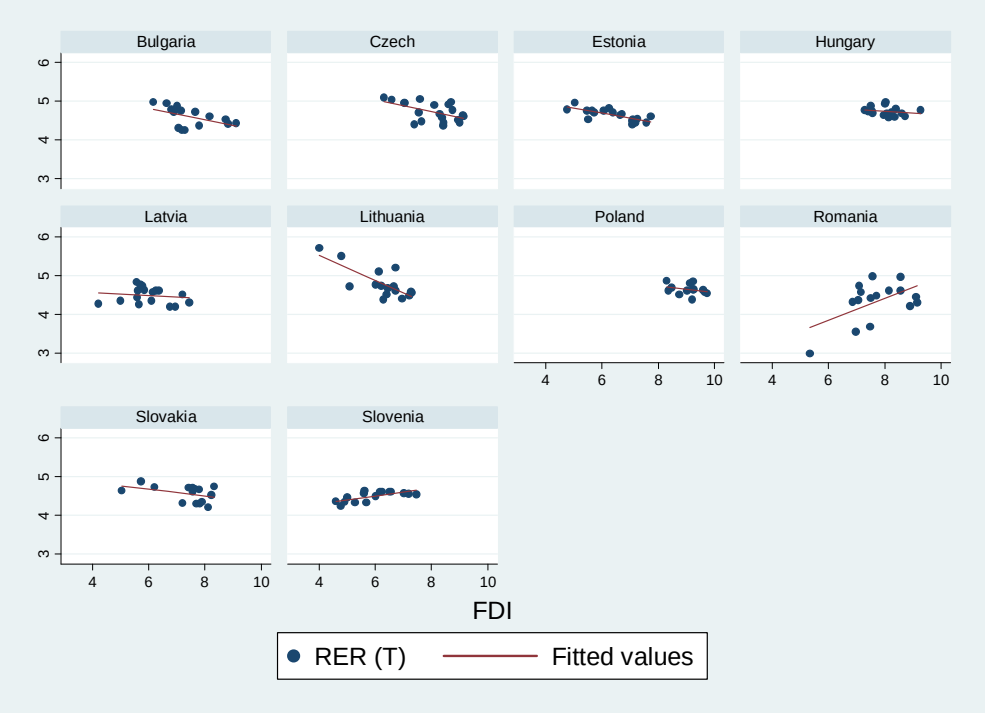


FIGURE 3.15: Foreign direct investment (horizontal axis) and real exchange rate in the tradables sector (vertical axis) in CEEC (logs)

FDI inflows in million Euro; RER(T) based on the GDP deflator; Source: Eurostat.

The effects of the progress in transition are analyzed as follows: The influence of price liberalization and privatization on the development of the RER is measured respectively by the share of administered prices in HICP (data provided by Eurostat)[32] and the private sector share in GDP (data from the EBRD transition reports). As in the section about the implementation of the tradables/nontradables dichotomy, the degree of openness as a measure for the progress in trade liberalization is calculated as the trade volume ratio to GDP with data from Eurostat.

The expected sign of the variable capturing the effect of privatization is positive, since increasing private sector share is associated with an intensification of competition and should thus lead to lower prices in the home country and to real depreciation. Likewise, the long-term effect of price liberalization and trade liberalization is expected to be real depreciation (positive sign of the coefficient of the degree of openness and negative of the share of administered prices in HICP). However, because of the short time span of the analysis, it is also possible to observe the opposite sign for trade liberalization, thus capturing the effect in the medium run. Whereas trade liberalization affects mainly the external real exchange rate, privatization and price liberalization can affect the prices of both tradables and nontradables relative to abroad.

Figure 3.16 shows the development of openness in CEEC calculated as the ratio of exports and imports of goods and services to GDP. The degree of openness has experienced very different developments in the CEEC under consideration. At the beginning of the transition process openness decreased probably due to shrinking trade with other former communistic countries. Especially in Slovenia and Latvia the drop of international trade between 1991 and 1994/1995 was substantial. An upturn in international trade followed in almost all countries and the degree of openness increased rapidly until 2007. International trade decreased again in 2009 as a result of the current economic crisis – a trend that was observed in developed economies as well. However, the pre-crisis level of openness was reached within two years in most of the countries. Over the entire time span since 1992, the most rapid increase in the degree of openness has been recorded in Hungary, Slovakia and Poland. This is probably due to their proximity to Western European countries.

[32] Price liberalization should lead to a decreasing share of administered prices.

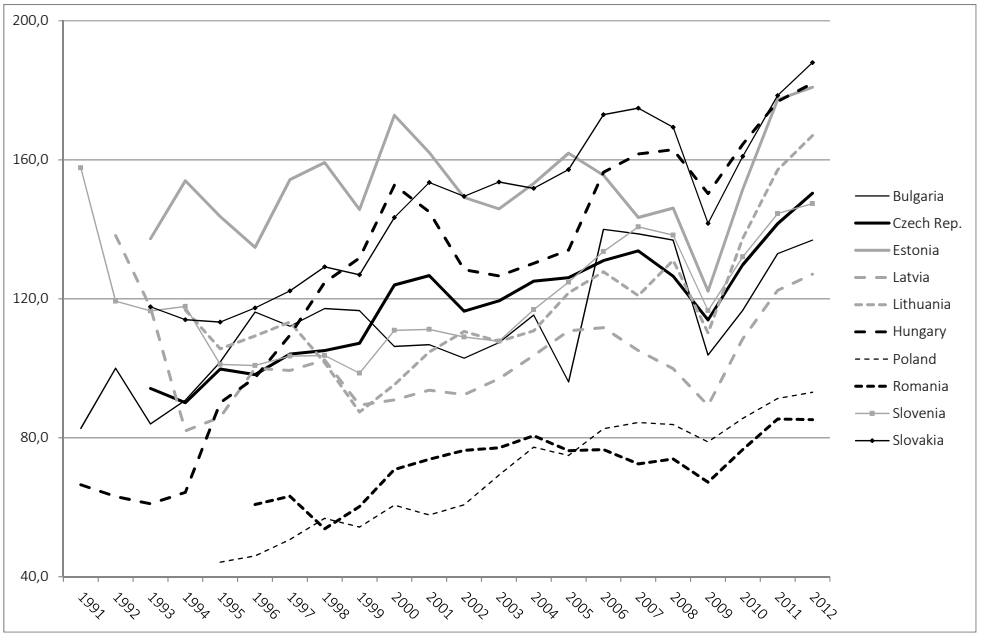


FIGURE 3.16: Degree of openness in CEEC

Degree of openness is calculated as value of international trade as percentage of GDP in percent. Source: Own calculations based on data from Eurostat.

The explanation for the positive relationship between the degree of openness and the real exchange rate refers mainly to the external real exchange rate. Trade liberalization is associated with increasing competition for domestically produced tradable goods. Therefore, tradable prices are expected to decrease with a higher degree of openness. This means real depreciation of the overall real exchange rate and RER of tradables (positive sign of the relationship).

The degree of openness is depicted against the external real exchange rates in CEEC in Figure 3.17. The trend lines show a negative relationship between the degree of openness and the real exchange rate in the tradables sector in five out of ten countries. The negative correlation is consistent with an adjustment of the home market to world market conditions at the beginning of the transition process.[33] However, the correlation is rather weak and is not present in the other countries.

Data about administered prices stems from Eurostat and covers the time period 2001-2013. Figure 3.18 depicts the share of administered prices in overall HICP in

[33] See Section 3.2.2.

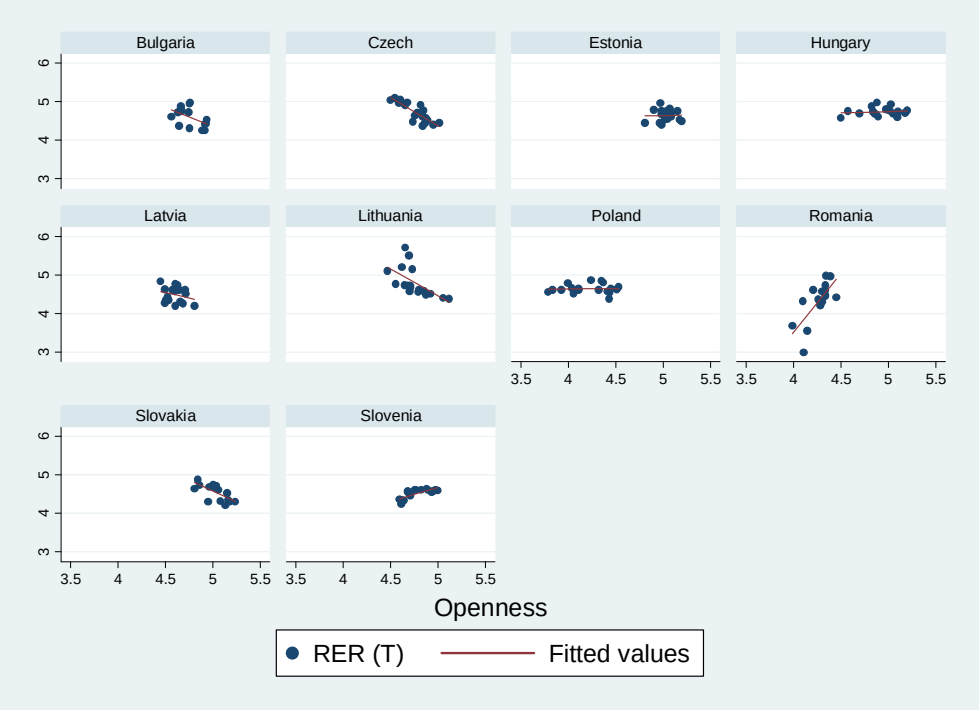


FIGURE 3.17: Openness (horizontal axis) and external real exchange rates (vertical axis) in CEEC (logs)

Degree of openness in percent of GDP and real exchange rates in CEEC; RER(T) based on the GDP deflator; Source: Own calculation based on data from Eurostat.

the time period 2001-2013, for which data is available. In Poland, Romania, Slovenia and the Czech Republic the share of administered prices has decreased since 2001. In Slovakia, Hungary and Bulgaria the share is higher in 2013 than twelve years ago. However, a higher share of administered prices does not necessarily mean that the number of regulated prices has increased. An unchanged or even decreasing number of price regulations has been accompanied by increasing prices of the particular goods and thus has led to an increasing share of these goods in HICP. Therefore, the number of HICP categories with administered prices will be used as an alternative to the share of administered prices to account for these effects.

Price regulation for water supply, refuse collection, sewerage collection, electricity and heat energy has been loosened in most of the countries. In some countries the prices in these categories went from fully administered to mainly administered (i.e. in Bulgaria, Latvia, Lithuania). In other countries price regulation has been abolished in most of these categories (i.e. in the Czech Republic, Estonia, Slovenia). In Hungary, the list of fully and mainly administered prices has remained

unchanged since 2001.

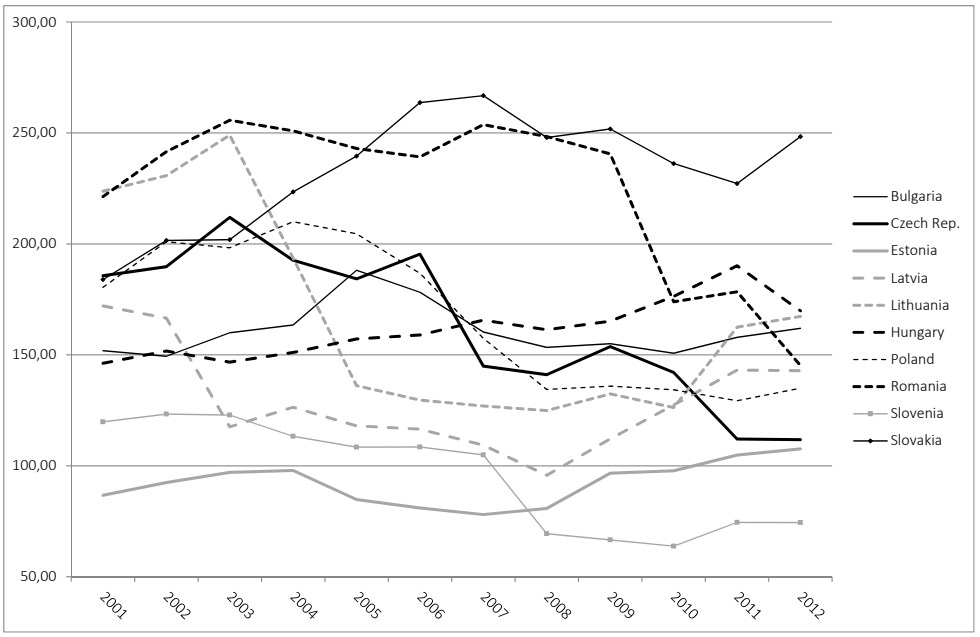


FIGURE 3.18: Share of administered prices in overall HICP

Source: Own calculation based on data from Eurostat.

In Figure 3.19, real exchange rates in CEEC are plotted against the share of administered prices in HICP. Whereas an increasing share of administered prices is associated with real appreciation in Estonia, Hungary and Slovakia, the opposite holds for Bulgaria, the Czech Republic, Lithuania, Poland, Romania and Slovenia. This diagram illustrates again the problem arising when using the share of administered prices in HICP as approximation for price liberalization. In Hungary, for instance, where the number of administered prices has remained unchanged, the higher share of administered prices came about via an increase of administered prices. Therefore, it is not the result of increasing price regulation.

To sum up, price liberalization should lead to real appreciation in the short run (negative sign) and real depreciation in the medium to long run (positive sign). However, the results should be interpreted with caution since the measurement of price liberalization is not unproblematic.

Figure 3.20 depicts the development of private sector share in GDP in CEEC. Most of the state enterprises were privatized in the 1990s. Therefore, the share of private sector in transition economies has not changed substantially in recent

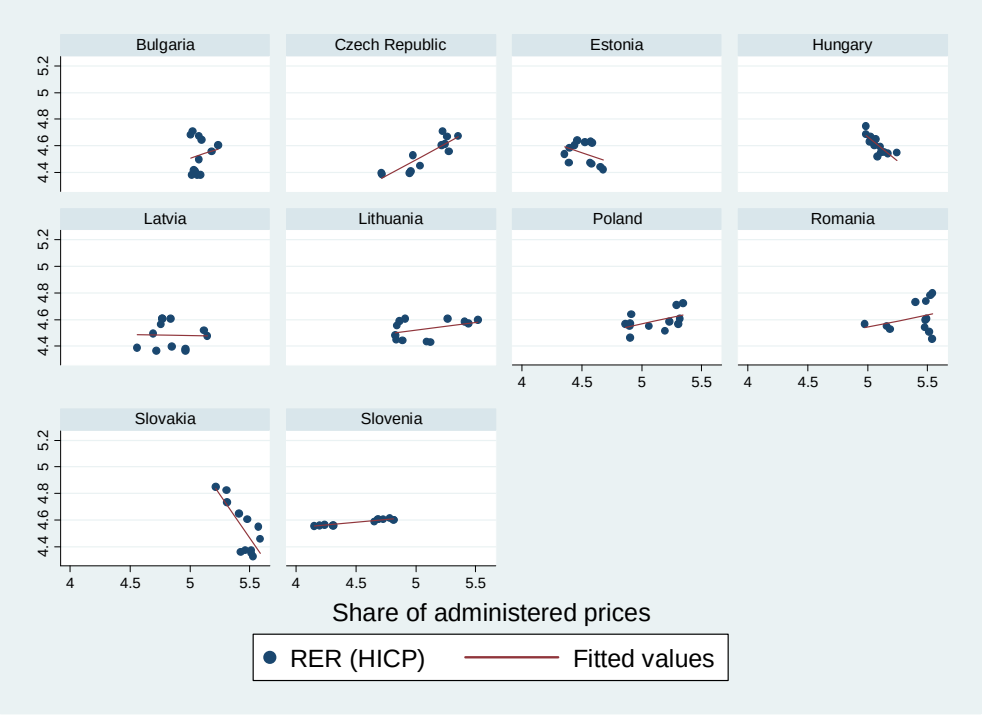


FIGURE 3.19: Share of administered prices (horizontal axis) and real exchange rates (vertical axis) in CEEC (logs)

Share of administered prices in HICP in percent and real exchange rates in CEEC; Overall RER based on HICP; Source: Own calculation based on data from Eurostat.

years. The effect of privatization on real exchange rate occurred in the early years of transition, if at all.

In Figure 3.21 private sector share in GDP is plotted against the real exchange rate in CEEC. Notwithstanding low variability of the time series, the diagram suggests a negative relationship between these variables since the private sector share increased in times of real appreciation. Nevertheless, the expected sign of the variable is positive both with regard to the overall real exchange rate and the real exchange rate of the tradables sector, since privatization is associated with intensification of competition and therefore with declining prices both of tradables and nontradables. The effect on the prices of tradables relative to nontradables is not clear and depends on the extent to which privatization has affected prices in these main categories of goods and services.

The effect of government consumption and investment on the real exchange rate is captured by their shares in GDP with data stemming from Eurostat relative to Germany. Theoretical models suggest a negative sign of the relationship between

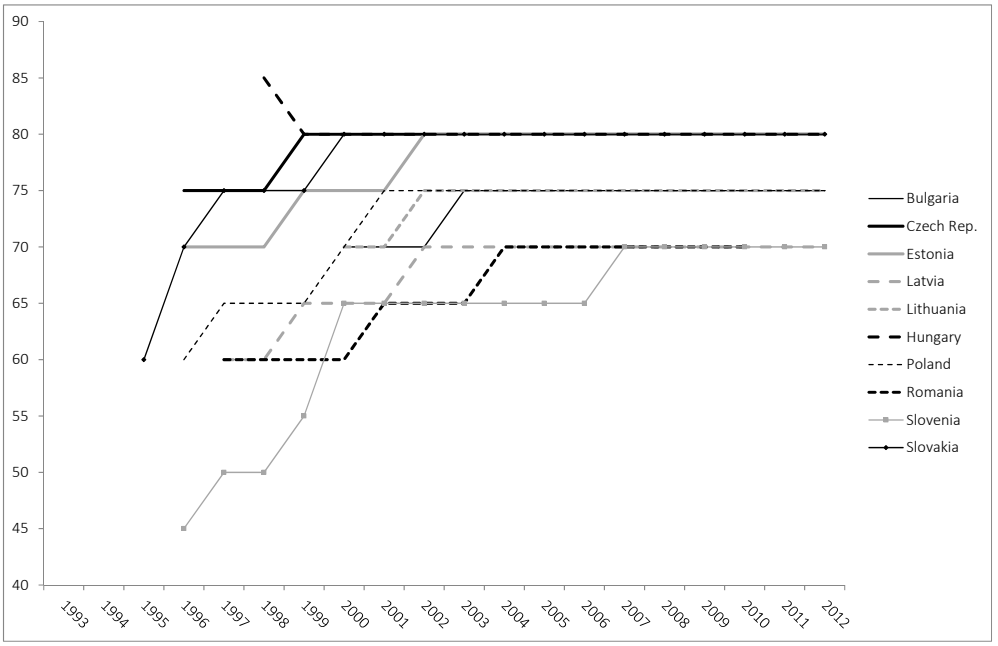


FIGURE 3.20: Private sector share in GDP

Source: European Bank for Reconstruction and Development.

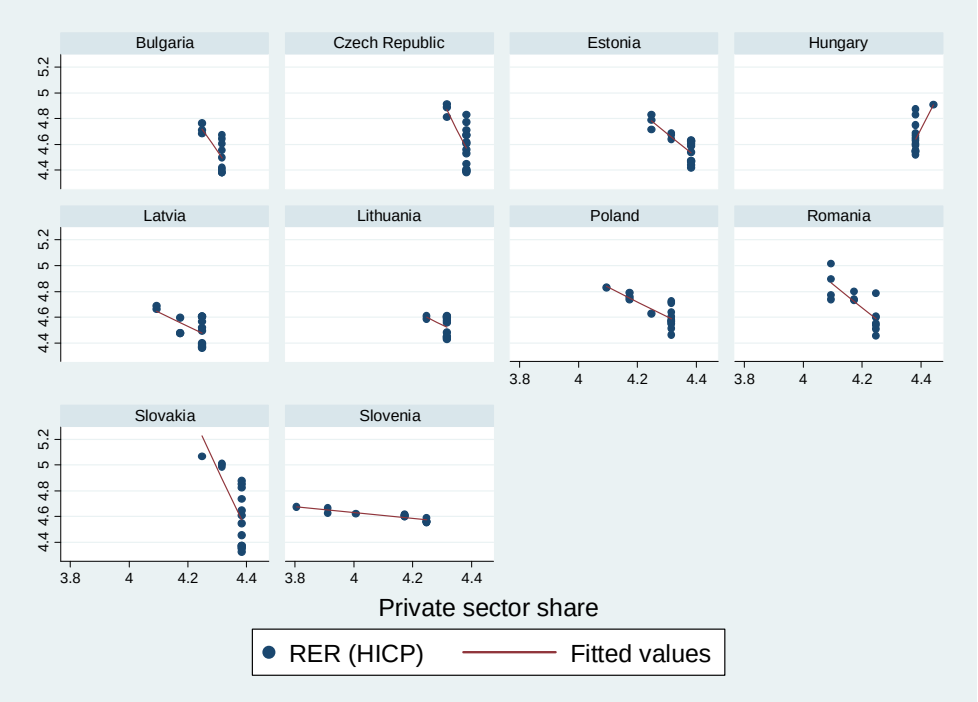


FIGURE 3.21: Private sector share in GDP (horizontal axis) and real exchange rates (vertical axis) in CEEC (logs)

Overall RER based on HICP; Source: European Bank for Reconstruction and Development, own calculations based on data from Eurostat.

government consumption and investment on the one hand and the real exchange rate on the other hand, since increasing values of these variables should lead to real appreciation via an increasing price of nontradables. In such a case, the expected sign in the equation of prices of tradables relative to nontradables will be negative as well. If, however, the share of installation costs is relatively low compared to that of tradable investment goods, the opposite sign will be the case with regard to investment demand, as pointed out earlier.

Figure 3.22 shows the development of government consumption (relative to Germany) in CEEC. The share of government consumption in GDP in transition economies decreased compared to Germany. If the negative relationship is empirically verified, then decreasing share of government consumption has weakened the real appreciation in CEEC.

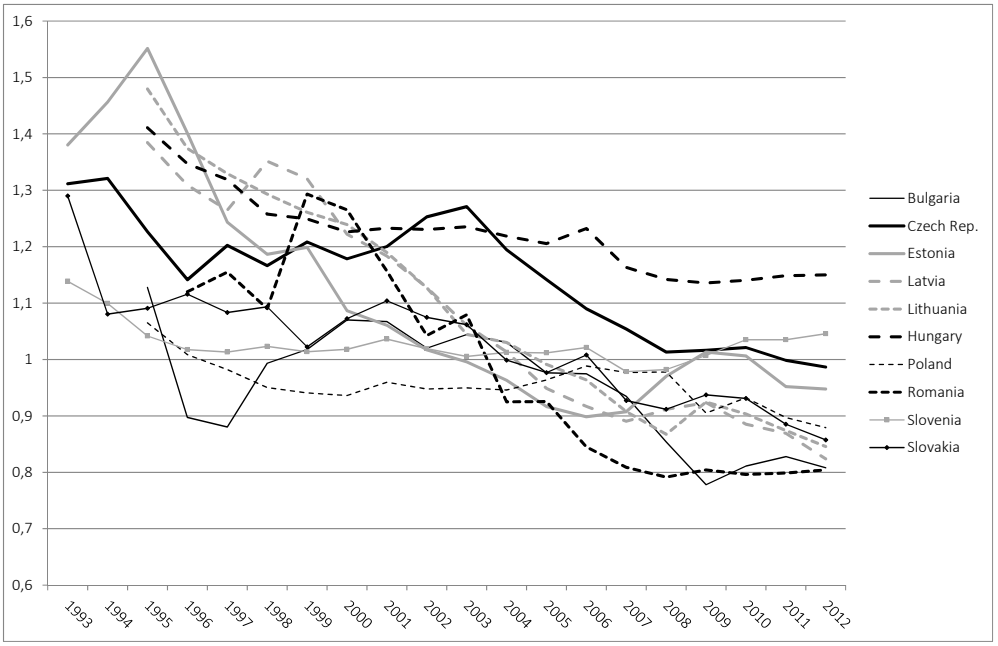


FIGURE 3.22: Government consumption

Government consumption as share in GDP relative Germany, Source: Own calculations based on data from Eurostat.

In Figure 3.23 government consumption is plotted against the prices of tradables relative to nontradables in CEEC. Contrary to the explanations above, the diagram shows a positive relationship in most of the countries. However, as in the case of private sector share in GDP, this could be the result of a *cum hoc ergo propter hoc* fallacy.

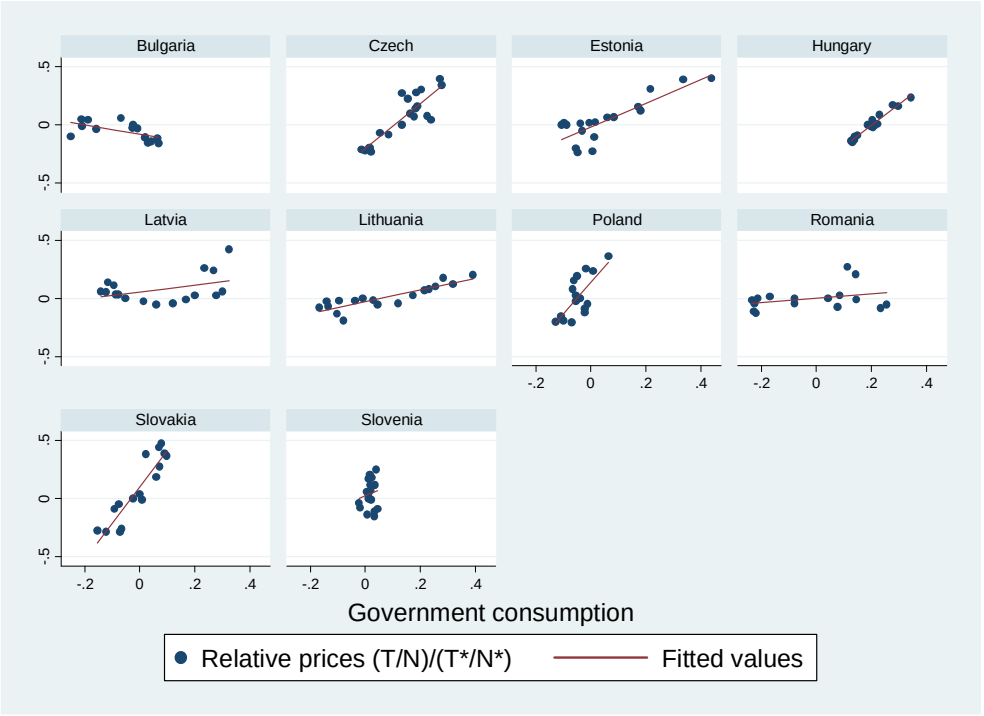


FIGURE 3.23: Government consumption (horizontal axis) and prices of tradables relative to nontradables (vertical axis) in CEEC (logs)

Government consumption as share in GDP relative Germany; Relative prices based on the GDP deflator; Source: Own calculations based on data from Eurostat.

Figure 3.24 shows the development of gross fixed capital formation as a share of GDP (relative to Germany). The process of transition was accompanied by an increasing investment share of GDP until 2007. The value dropped substantially during the economic crisis and has been recovering since then.

In Figure 3.25 gross fixed capital formation is plotted against prices of tradables relative to nontradables. In most of the countries the diagram shows that higher investment corresponds to decreasing relative prices. If this relationship is verified by the empirical analysis, it will confirm the explanations proposed by theoretical models.

Table 3.16 summarizes the expected signs of the coefficients of the corresponding independent variables in the empirical analyses of the overall real exchange rate and its two main components.

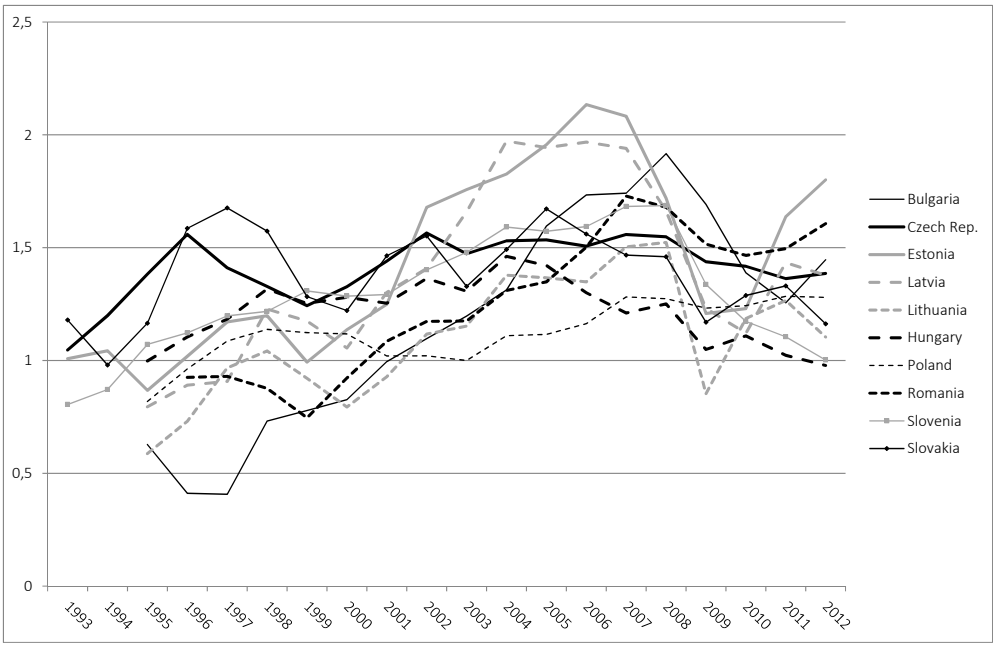


FIGURE 3.24: Investment demand

Gross fixed capital formation as share in GDP relative Germany, Source: Own calculations based on data from Eurostat.

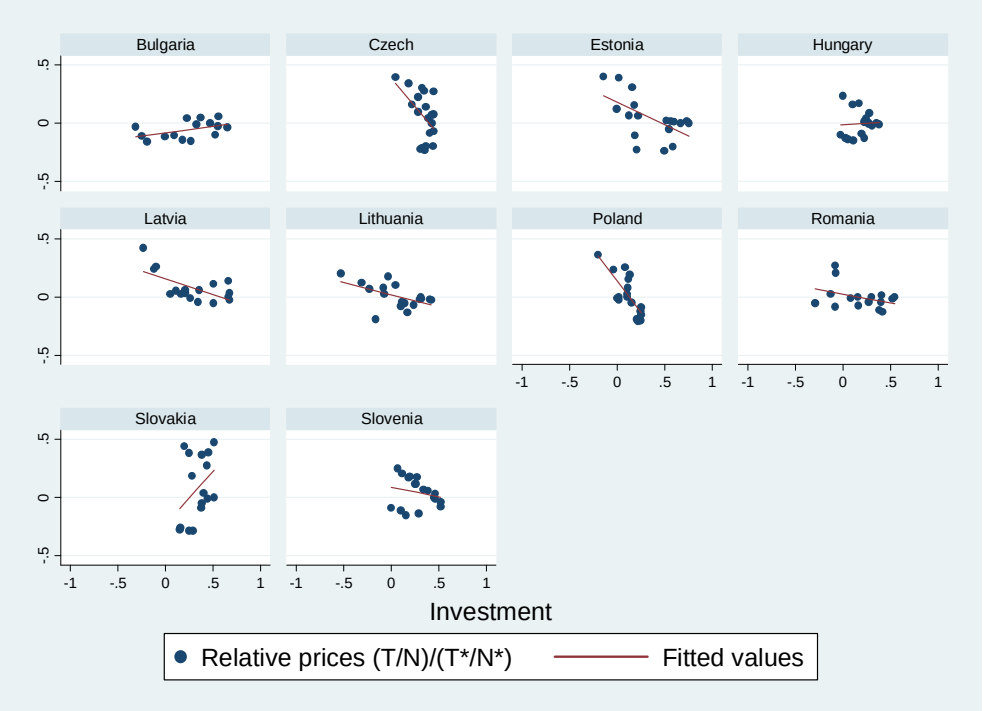


FIGURE 3.25: Investment (horizontal axis) and prices of tradables relative to nontradables (vertical axis) in CEEC (logs)

Gross fixed capital formation as share in GDP relative Germany; Relative prices based on the GDP deflator; Source: Own calculations based on data from Eurostat.

TABLE 3.16: Expected signs of the coefficients in the empirical analysis

Independent variable	RER q	RER (T) q^T	Relative Prices (T/N)/(T*/N*) q^N
Productivity (T/N)/(T*/N*)	-	(+)	-
Consumption (N/T)/(N*/T*)	-	(+)	-
Consumption (L/B)/(L*B*)	-	-	+
Government consumption	-	(+)	-
Investment	+/-	(+/-)	+/-
FDI	-	-	
Openness	-	-	
Private sector share	+	+	+/-
Share of administered prices	+/-	+/-	+/-

3.4.4 Empirical model

The stationarity of the time series is tested using the Fisher test.[34] Similarly to the IPS test, the Fisher test uses separate Dickey-Fuller unit root tests for the N cross-section units instead of pooling the data. The combination of the observed significance levels from the different tests is brought about using the additive property of the variables as suggested by Fisher (1932). In the present case the methods proposed by Choi (2001) are used to combine the p-values. The advantage is that the test does not require a balanced panel and explicitly allows for gaps in the data set. The null hypothesis that all panels contain a unit root is tested against the alternative that at least one panel is stationary.

The inverse normal Z-values reported in Table 3.17 refer to the Fisher test with drift since all time series possess non-zero means. Cross-sectional averages are removed from the data in order to control for cross-sectional correlation as suggested by Levin, Lin and Chu (2002). The inverse normal Z-statistics indicate that the null hypothesis that all panels contain a unit root can be rejected for all variables used in the empirical analyses. Therefore, the empirical analyses in the next subsection treat the variables as stationary.

[34] See e.g. Whitehead (2002).

TABLE 3.17: Unit root tests

time series	Z
RER (GDP deflator)	-6.2029***
RER (HICP)	-5.6936***
RER (T)	-6.3153***
$(P^T/P^N)/(P^{T*}/P^{N*})$	-3.8504***
Productivity (T/N)/(T*/N*)	-5.4135***
Consumption (N/T)/(N*/T*)	-6.6368***
Consumption (L/B)/(L*B*)	-4.8511***
Government consumption	-3.3308***
Investment	-4.4838***
GDP per capita	-6.6541***
FDI	-7.9585***
Openness	-7.0501***
Private sector share	-9.0656***
Share of administered prices	-2.7500***
No. of administered prices	-3.1508***

Inverse normal Z statistic from the Fisher ADF unit root test for panel data with drift;
H_0: All panels contain a unit root;
*** significant at 1%;
Source: Own calculations.

The empirical model used to estimate the effects of the independent variables on the overall exchange rate and the two components can be summarized as follows:[35]

$$y_{it} = \alpha + x'_{it}\beta + \upsilon_i + \epsilon_{it} \tag{3.15}$$

υ_i represents the unit-specific time-invariant residual accounting for cross-section heterogeneity and ϵ_{it} is the conventional residual with the usual properties. x'_{it} contains the itth observation on the explanatory variables and β is vector with the coefficients of interest. The fixed-effects model deals with the correlation between υ_i and the variables in x_{it} by using the OLS estimators of the following transformation of equation (3.15):

$$y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i)'\beta + (\epsilon_{it} - \bar{\epsilon}_i) \tag{3.16}$$

[35] On econometric analysis of panel data see Baltagi (2005).

Therefore, the reported coefficients refer to the effect of one unit increase in the particular explanatory variables on the dependent variable within the cross-section units. Alternatively, in a random-effects model, the between and within estimators can be combined to produce more efficient results than in the fixed-effects model. However, the results of the random effects model are inconsistent, if the unit-specific residuals υ_i are correlated with x_{it}. In such cases, the coefficients estimated by the random-effects model are significantly different from those estimated by the fixed-effects model, and the random-effects model is misspecified. The Hausman test is used to test the equality of coefficients in the random-effects model and in the fixed-effects model. The null hypothesis of no difference between the coefficients can be rejected for all specifications.[36] Therefore, the fixed-effects model was used since it delivers consistent estimates.

Besides the efficiency problem, there is one additional point that should be stressed when using fixed-effects models: Since the model assumes time-invariant unit-specific residuals, it is not possible to estimate the effect of further time-invariant variables. In the context of the present analysis of real exchange rates, for instance, it is not possible to use dummy variables for the group of countries that joined the European Union in 2004 because this dummy variable remains unchanged over the entire time span.

The reported standard errors are adjusted for possible heteroscedasticity and for cluster-specific effects alongside the cross-section units. The effect of the economic crisis is captured by a dummy variable that takes the value one in 2008-2012. Alternatively time dummies are used for the years 2008-2012 in order to account for time varying effects during the economic crisis not captured by the explanatory variables in the regression. Therefore, the end model to be estimated is given by the following equations:

$$q_{it} = \alpha_1 + x'_{it}\beta_1 + d_{1,08}D08 + ... + d_{1,12}D12 + \upsilon_{1i} + \epsilon_{1it}, \tag{3.17}$$

$$q^N_{it} = \alpha_2 + x'_{it}\beta_2 + d_{2,08}D08 + ... + d_{2,12}D12 + \upsilon_{2i} + \epsilon_{2it}. \tag{3.18}$$

$$q^T_{it} = \alpha_3 + x'_{it}\beta_3 + d_{3,08}D08 + ... + d_{3,12}D12 + \upsilon_{3i} + \epsilon_{3it}, \tag{3.19}$$

[36] See Tables 3.18-3.20

with all variables converted into logarithms. In the first equation, the dependent variable is measured either by HICP based real exchange rate or by real exchange rate calculated with the GDP deflator. The second equation explains the internal RER and includes only explanatory variables for the prices of tradables relative to nontradables (all explanatory variables except for FDI and the degree of openness). The third equation explains the external or trade-related RER and contains explanatory variables of the RER in the external sector presented in Section 3.2.2, i.e. FDI, the degree of openness and private sector share in GDP. In a further specification the regression is extended by including explanatory variables for relative prices as well as consumption of luxury relative to basic goods and services. The reason is the possibility of having a nontradable component in tradable prices, which is affected by the same variables as the RER in the sheltered sector. Furthermore, if the assumption of PPP is not fulfilled in the tradables sector, these variable will not only affect the relative prices but also the prices of tradables. The share of administered prices in HICP and the private sector share in GDP are included only as additional estimators into the regressions in some specifications since these time series are much shorter in all CEEC than those of other variables. For the variables capturing the effect of investment demand, FDI and openness lagged values are used since these variables can be affected by the real exchange rate as well. Nevertheless, the problem of possible reverse causation is not solved and the coefficients should be interpreted as correlation rather than causation.

3.4.5 Results

Tables 3.18-3.20 show the results of the empirical analysis over the time span 1993-2012. The coefficient of the productivity variable turned out to be significant and negative in all four specifications of the regression analysis of relative prices (Table 3.19). If productivity growth in the tradables sector relative to nontradables sector is 10.0 percent higher in the transition economies than in Germany, then the relative price of tradables to nontradables (relative to Germany) decreases by 4.2-8.6 percent. This result indicates that productivity development is an important driving force of relative prices as suggested by Balassa (1964) and Samuelson (1964). The coefficients of relative productivity in the extended model of the real exchange rate of the tradables sector are not significant, again in line with the theoretical explanations. Furthermore, the effect of relative productivity turned out to be significant in five out of eight specifications of the overall real exchange

rate. In these cases, the coefficient ranges between -0.25 and -0.56. In the other three specifications the coefficient is insignificant. These are regressions that include the variables capturing the effect of administered prices and privatization.

There are two possible explanations for the insignificant coefficient. First, correlation analysis reveals that the insignificant effect of the productivity variable is possibly the result of multicolinearity since the correlation between relative productivity and the share of administered prices is relatively high, over 0.4. Second, the time span covered by the regressions including these variables is shorter than in the other regressions, since data on administered prices is available since 2001.

Two further regressions were performed in order to check the validity of these two hypotheses.[37] In the first regression the share of administered prices reported by Eurostat is replaced by a measure reported by EBRD. The time series start earlier but end in 2009 and the correlation between the share of administered prices and the productivity variable is lower, 0.09. Including this proxy for price liberalization leaves the significant coefficient of the productivity variable unaffected. In the second regression the time span is reduced to 2001-2013 and the variables capturing the effects of price liberalization and privatization are excluded. As a result the productivity variable becomes again insignificant in the regression of the RER both based on HICP and the GDP deflator. Therefore, the insignificant coefficient of relative productivity in the regressions reported in Table 3.13 is rather the result of the different time span and less so the result of multicolinearity. The impact of relative productivity seems to have weakened since 2001.

The coefficient of relative productivity becomes again significant in the regression of RER based on the GDP deflator when the dummy variable for the economic crisis is replaced by time fixed effects for the years after 2007. The peak in 2009 due to an extremely low value for tradables productivity in Germany has possibly biased the results if not allowed for time fixed effects. Summing up, the results indicate that relative productivity is one of the driving forces of the real exchange rate in the process of transition, although the effect has become less pronounced in recent years.

[37] See Table 3.29 at the end of the present chapter.

TABLE 3.18: Explanations for the development of the overall real exchange rate

	RER (1) (GDP-Deflator)	RER (2) (GDP-Deflator)	RER (3) (GDP-Deflator)	RER (4) (GDP-Deflator)	RER (5) (HICP)	RER (6) (HICP)	RER (7) (HICP)	RER (8) (HICP)
Productivity (T/N)/(T*/N*)	-.3588**	-.2867	-.4713***	-.5553**	-.2503*	-.1135	-.3056**	.0774
	(.1306)	(.2646)	(.1134)	(.2359)	(.1166)	(.1410)	(.0979)	(.1768)
Consumption (N/T)/(N*/T*)	.7919*	.5790***	.8727**	.6400***	.3925***	.3037***	.4033***	.0450
	(.3902)	(.1475)	(.3707)	(.1261)	(.0897)	(.0512)	(.0760)	(.0304)
Consumption (L/B)/(L*B*)	-.2766	-.2034	-.2352	-.1295	-.1190**	-.0925***	-.1009**	-.0852*
	(.2037)	(.1191)	(.1888)	(.0934)	(.0369)	(.0227)	(.0410)	(.0501)
Government consumption	.3292	.5295	.4030	.6602*	.2320	.3312*	.2353	.2039
	(.4239)	(.3496)	(.4512)	(.3118)	(.1839)	(.1707)	(.1894)	(.1864)
L.Investment	.3643**	.1305	.3691*	.1162	.1761**	.0916	.1658**	-.0656
	(.1536)	(.1318)	(.1767)	(.1274)	(.0573)	(.0646)	(.0671)	(.0683)
L.FDI	-.0650*	-.0421*	-.0517	-.0391	-.0311**	-.0218*	-.0273*	.0198**
	(.0294)	(.0230)	(.0322)	(.0258)	(.0130)	(.0107)	(.0131)	(.0092)
L.Openness	.2372	.1563	.2656	.1714	-.0785	.0213	-.1108	-.0410
	(.2044)	(.1415)	(.2303)	(.1595)	(.1190)	(.0590)	(.1287)	(.0737)
Private sector share		1.2724**		.9184**		.4637**		-.0757
		(.3938)		(.3403)		(.1914)		(.2716)
Share of administered prices		-.0529		-.0683		-.1283**		-.0748*
		(.1122)		(.0867)		(.0540)		(.0411)
DCrisis	.0084	-.0354			-.0067	-.0567***		
	(.0556)	(.0328)			(.0237)	(.0168)		
D2008			-.0862	-.1014***			-.0395*	-.1292***
			(.0512)	(.0273)			(.0184)	(.0314)
D2009			.0926	.1016*			.0423	-.1254**
			(.0639)	(.0507)			(.0243)	(.0594)
D2010			.0761	.0496			-.0269	-.1399***
			(.0762)	(.0273)			(.0393)	(.0424)
D2011			.0636	.0159			.0138	-.1350***
			(.0776)	(.0271)			(.0357)	(.0441)
D2012			.0532	.0369			.0336	-.1217***
			(.0927)	(.0487)			(.0359)	(.0433)
Constant	3.8233***	-1.1171	3.5866**	.3453	5.1330***	3.2935***	5.2514***	5.3855***
	(1.1611)	(1.6727)	(1.2603)	(1.7085)	(.5724)	(.7679)	(.6378)	(.8644)
Adj. R-Square	.6638	.6565	.6744	.6896	.7949	.7792	.8046	.6597
Observations	143	110	143	110	139	110	139	110
Hausman χ^2	147.06	132.06	110.76	277.61	148.56	20.54	132.58	14.55[1]
Fixed/random effects	FE	FE	FE	FE	FE	FE	FE	RE

Source: Own calculations

*/**/*** significant at 10%/5%/1%;[1] not significant

Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation.

TABLE 3.19: Explanations for the development of relative prices of tradables to nontradables (relative to Germany)

	Relative prices (1)	Relative prices (2)	Relative prices (3)	Relative prices (4)
Productivity (T/N)/(T*/N*)	-.7647***	-.4231***	-.8423***	-.8602***
	(.0672)	(.1263)	(.0860)	(.1883)
Consumption (N/T)/(N*/T*)	.2550	-.0284	.2645	.0932
	(.2503)	(.0420)	(.2390)	(.2150)
Consumption (L/B)/(L*/B*)	.0851	.0547	.1336	.0940
	(.1147)	(.0552)	(.1122)	(.0990)
Government consumption	.1963	.2947**	.1562	.1427
	(.2531)	(.1441)	(.2432)	(.1570)
L.Investment	-.0220	.0822	-.0909	-.0478
	(.0723)	(.0644)	(.0895)	(.1026)
Private sector share		-.2449		-.6153**
		(.1880)		(.2524)
Share of administered prices		.0746***		-.0276
		(.0238)		(.0539)
DCrisis	.0193	-.0419**		
	(.0281)	(.0211)		
D2008			-.0029	-.0121
			(.0181)	(.0158)
D2009			.1116*	.0968**
			(.0532)	(.0353)
D2010			.0025	-.0026
			(.0361)	(.0311)
D2011			.0024	.0034
			(.0423)	(.0409)
D2012			-.0003	.0041
			(.0428)	(.0389)
Constant	-.1499	.5000	-.1318	2.5482**
	(.1261)	(.8674)	(.1110)	(1.1184)
Adj. R-Square	.7345	.6053	.7527	.6803
Observations	146	113	146	113
Hausman χ^2	44.95	.86	53.94	40.34
Fixed/random effects	FE	RE	FE	FE

Source: Own calculations
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation.

TABLE 3.20: Explanations for the development of the real exchange rate in the tradables sector

	RER of tradables (1)	RER of tradables (2)	RER of tradables (3)	RER of tradables (4)	RER of tradables (5)	RER of tradables (6)	RER of tradables (7)	RER of tradables (8)
Productivity (T/N)/(T*/N*)					.1098	.1556	.0598	.0076
					(.1078)	(.1443)	(.1021)	(.1449)
Consumption (N/T)/(N*/T*)					.5331*	.4205**	.5925**	.4628**
					(.2395)	(.1575)	(.2418)	(.1711)
Consumption (L/B)/(L*B*)					-.3591**	-.2230**	-.3510**	-.1852***
					(.1226)	(.0696)	(.1150)	(.0452)
Government consumption					.1915	.4553	.2776	.5479*
					(.2812)	(.2915)	(.3122)	(.2575)
L.Investment					.3502**	.1131	.3918**	.1240
					(.1366)	(.1119)	(.1563)	(.0961)
L.FDI	-.0789	-.0173	-.0483	-.0254	-.0450	-.0369	-.0334	-.0326
	(.0478)	(.0182)	(.0466)	(.0208)	(.0260)	(.0231)	(.0286)	(.0265)
L.Openness	.2532	-.0128	.1516	-.0113	.3397	.1959	.3568	.1931
	(.1414)	(.1332)	(.1667)	(.1516)	(.1979)	(.1756)	(.2002)	(.1891)
Private sector share		.9588***		.9541***		1.2549***		1.0293***
		(.2482)		(.2691)		(.2389)		(.2251)
Share of administered prices						-.0792		-.0861
						(.0831)		(.0723)
DCrisis	-.1928***	-.1961***			-.0293	-.0595*		
	(.0418)	(.0450)			(.0505)	(.0273)		
D2008			-.2343***	-.2461***			-.0957**	-.1025***
			(.0440)	(.0380)			(.0416)	(.0290)
D2009			-.1104**	-.1194**			-.0086	.0135
			(.0489)	(.0497)			(.0430)	(.0465)
D2010			-.1676**	-.1835***			.0352	-.0029
			(.0718)	(.0625)			(.0819)	(.0325)
D2011			-.2284***	-.2287***			.0296	-.0231
			(.0632)	(.0574)			(.0837)	(.0301)
D2012			-.2234***	-.1935***			.0163	.0008
			(.0822)	(.0667)			(.0835)	(.0419)
Constant	4.0238***	.7011	4.2877***	.7726	3.2423**	-1.0171	3.0627**	-.0591
	(.7929)	(1.1245)	(.9533)	(1.3643)	(1.0011)	(1.2554)	(1.0102)	(1.3775)
Adj. R-Square	.2131	.2105	.7019	.7295	.5521	.5933	.5592	.6044
Observations	161	146	161	146	143	110	143	110
Hausman χ^2	9.71	4.27[1]	11.96[1]	3.43[1]	27.31	87.18	201.15	88.23
Fixed/random effects	FE	RE	RE	RE	FE	FE	FE	FE

Source: Own calculations

*/**/*** significant at 10%/5%/1%;[1] not significant

Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation.

The coefficient of consumption of nontradables relative to tradables (compared to Germany) turned out to be significant and positive in seven out of eight regressions of the overall real exchange rate. This result is inconsistent with the proposition by Bergstrand (1991). A possible explanation for the positive sign of the coefficient is that increasing demand for tradables has led to real appreciation via increasing prices of tradables. This result is also confirmed by the extended regressions of the external real exchange rate. In all four regressions, where demand side explanations were included the coefficient of consumption of nontradables relative to tradables is significantly positive.

The second demand variable, consumption of luxury goods relative to basic goods (again compared to Germany) has a significantly negative effect in all regressions of the real exchange rate of the tradables sector. Increasing demand for luxury goods leads to increasing prices of tradable goods in the transition economies compared to abroad. In the regressions of the overall real exchange rate the effect of the relative consumption variable is significant in the regressions of RER based on HICP. Therefore, the argumentation proposed by Bergstrand (1991) has to be adjusted for the transition economies in order to account for the fact that in these economies luxury goods are (still) mostly tradables.

Other demand side explanations proposed in the literature are government consumption and investment demand. The effect of government consumption on the overall real exchange rate and its two components is mostly not significant. Only in two regressions of the overall real exchange rate and one regression of relative prices the coefficient is significantly positive at the 10 and 5 percent level, respectively. Therefore, the empirical analysis reveals only weak evidence that increasing government consumption affects the real exchange rate and the coefficient is contrary to the expectations positive.

The effect of investment demand, on the contrary, is significant in two specifications of the real exchange rate of the tradables sector and in four specifications of the overall real exchange rate. As opposed to the explanation proposed by Schröder and Pfadt (1998), Fischer (2002) and Bhagwati (1984), the coefficient of investment demand is positive. Increasing investment demand is associated with decreasing prices of tradables relative to abroad and leads to real depreciation of the overall real exchange rate. This outcome is possibly the result of augmented

demand for imported investment goods.

From the variables measuring the progress in transition only private sector share in GDP and share of administered prices in CPI have significant coefficients in regressions of the overall real exchange rate. An increase of private sector share in GDP is associated with real depreciation as a result of an intensification of competition. The coefficients of this variable are hightly significant and positive in all specifications of the external real exchange rate. Furthermore, privatization has led to decreasing prices of tradables relative to nontradables, as indicated by the significantly negative coefficient of private sector share in GDP in column (4) of Table 3.19.

The share of administered prices has a significantly negative effect in the regressions of overall RER based on HICP. Lower share of administered prices leads to real depreciation in accordance with the theoretical explanations. The coefficients of trade liberalization measured by the degree of openness, on the contrary, is insignificant in all specifications.

The coefficient of foreign direct investment turned out to be negative and significant at least at the 10 percent level in five out of ten specifications of the overall RER. In the last regression, however, it is positive and significant at the 5 percent level. Therefore, the effect of FDI inflows on the overall real exchange rate is not robust. Furthermore, according to the theoretical explanations, FDI inflows should affect RER via appreciation of the external real exchange rate. The coefficient of the variable FDI is, though, insignificant in all specifications in Table 3.20.

The dummy variable for the effect of the economic crisis as well as the time dummies have no significant effect on the real exchange rate in most of the specifications of the overall RER. The regressions of external RER indicate, on the contrary, that real appreciation has accelerated in the tradables sector since 2008. The dummy variables DCrisis as well as D2008-D2012 are significant especially in the specifications where only driving forces for the real exchange rate of tradables were included. If additional explanatory variables are added, the time dummies become mostly insignificant.

3.4.6 Robustness and some further results

The empirical analysis in the previous subsection reveals some major insights about the driving forces of real exchange rates in CEEC. In this subsection, a range of different estimators and specifications are used as a check for the robustness of the results presented above. First, the share of administered prices in HICP is replaced by the number of regulated price. As pointed out earlier, the share of administered prices is not a perfect measure for price liberalization since increasing values do not necessarily mean more price regulation. Second, the effect of Euro adoption is tested by introducing a dummy variable and interaction terms to measure if productivity- and consumption-driven real appreciation was sped up or slowed down by the introduction of the common currency. Third, the effect of consumption expenditure is further analyzed using a different estimator, namely consumption of luxury goods relative to Germany. And fourth, the panel analysis is complemented by time series analyses for transition economies where a longer time span of data is available.

Alternative measurement of price liberalization

In Table 3.21, the second specifications shown in Tables 3.18-3.20 are reestimated using the number instead of share of administered prices. The number of administered prices is more suitable measure for price liberalization since increasing values are associated with intensification of price regulation. However, its low variability makes it less suitable as explanatory variable in empirical analyses. In Hungary, for instance, the number of administered prices has remained unchanged since 2001. In other transition economies, the list of fully and mainly administered prices changes only every few years. Replacing the share of administered prices by the number of administered prices leaves the results of the empirical analysis for most of the specifications unchanged. However, the coefficient of administered prices with regard to the overall RER based on HICP is no more significant. Thus, the effect of price liberalization on the real exchange rate is not robust to changes in the measurement of price liberalization, although the disaggregated analysis of HICP above shows that services related to housing were an important source of real appreciation.

TABLE 3.21: Robustness check: Alternative measurement of price liberalization

	RER (GDP deflator) (1)	RER (HICP) (2)	Relative prices (3)	RER (tradables) (4)
Productivity (T/N)/(T*/N*)	-.2702	-.1640	-.6945**	.1592
	(.3413)	(.1916)	(.2269)	(.1942)
Consumption (N/T)/(N*/T*)	.5631***	.2817***	.0974	.3954**
	(.1530)	(.0416)	(.2414)	(.1392)
Consumption (L/B)/(L*/B*)	-.2204*	-.1123***	.0403	-.2422***
	(.1140)	(.0286)	(.1079)	(.0606)
Government consumption	.5129	.3878*	.1383	.4611
	(.3739)	(.1971)	(.1780)	(.3007)
L.Investment	.1627	.1275*	.0425	.1537
	(.1361)	(.0678)	(.0732)	(.1189)
L.FDI	-.0442	-.0217		-.0391
	(.0249)	(.0125)		(.0252)
L.Openness	.1732	.0509		.2125
	(.1280)	(.0556)		(.1583)
Private sector share	1.3119**	.5644**	-.5071*	1.3156***
	(.4210)	(.2338)	(.2521)	(.2489)
No. of administered prices	.1011	-.1690	.0166	.0393
	(.3233)	(.1555)	(.1903)	(.2279)
Dcrisis	-.0309	-.0433*	.0061	-.0535*
	(.0336)	(.0225)	(.0226)	(.0253)
Constant	-1.9013	2.4609***	1.9086	-1.8739**
	(1.4304)	(.6632)	(1.1672)	(.6752)
Adj. R-Square	.6565	.7532	.6499	.5890
Observations	109	109	112	109
Hausman χ^2	91.08	267.84	31.60	22.82
Fixed/random effects	FE	FE	FE	FE

Source: Own calculations;
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation.

Effects of Euro adoption

The effects of Euro adoption on real exchange rates and their driving forces are investigated using a dummy variable called DEuro. It takes the value one beginning in 2007 in Slovenia, 2009 in Slovakia and 2011 in Estonia, and zero otherwise. The time span since the introduction of the common currency in these three countries is rather short. Furthermore, it overlaps to a large extent with the time span since the beginning of the economic crisis. Therefore, the dummy variable DEuro is used in addition to the dummy for the effect of the economic crisis. Nevertheless, the results should be interpreted with caution.

Table 3.22 shows the results of regressions including the dummy variable DEuro. The coefficients of the explanatory variables remain by and large unchanged. The coefficients of the dummy variable DEuro are insignificant in the regressions of the

TABLE 3.22: Effects of Euro adoption on the real exchange rate development

	RER (GDP deflator) (1)	RER (HICP) (2)	Relative prices (3)	RER (tradables) (4)
Productivity (T/N)/(T*/N*)	-.3803***	-.2642**	-.6935***	.0545
	(.1093)	(.1160)	(.0522)	(.1025)
Consumption (N/T)/(N*/T*)	.7835*	.3891***	.2649	.5115**
	(.3742)	(.0830)	(.2611)	(.2052)
Consumption (L/B)/(L*/B*)	-.2877	-.1274**	.1213	-.3876**
	(.2078)	(.0407)	(.0999)	(.1292)
Government consumption	.3032	.2090	.2796	.1245
	(.4246)	(.1867)	(.2323)	(.2456)
L.Investment	.3659**	.1783**	-.0257	.3543**
	(.1528)	(.0588)	(.0622)	(.1279)
L.FDI	-.0651*	-.0311**		-.0450
	(.0299)	(.0131)		(.0274)
L.Openness	.2250	-.0898		.3083
	(.2054)	(.1161)		(.1906)
DCrisis	.0003	-.0127	.0424*	-.0500
	(.0486)	(.0184)	(.0226)	(.0418)
DEuro	.0477	.0359	-.1287***	.1225**
	(.0905)	(.0407)	(.0354)	(.0524)
Constant	3.8645***	5.1759***	-.1009	3.3484***
	(1.1565)	(.5440)	(.1190)	(.9411)
Adj. R-Square	.6629	.7961	.7664	.5697
Observations	143	139	146	143
Hausman χ^2	355.03	90.99	67.55	61.04
Fixed/random effects	FE	FE	FE	FE

Source: Own calculations;
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation.

overall real exchange rate, based on both GDP deflator and HICP. However, the coefficients are significantly different from zero for the two components of the real exchange rate. The coefficient in the regression of the real exchange rate in the tradables sector is positive and indicates that the real appreciation in the tradables sector has been less pronounced since the adoption of the common currency. The coefficient in the regression of the prices of tradables in terms of nontradables is negative. Thus, real exchange rate appreciation via increasing relative prices of nontradables has gained importance since the accession to the monetary union. A possible explanation for this result is as follows: The introduction of the common European currency is expected to strengthen the propostion of Purchasing Power Parity. Deviations from PPP are less likely to occur in a monetary union. Koedijk et al. (2004) show, for instance, that the process of economic integration has accelerated convergence toward PPP within EMU. Therefore, tradable prices adjustment is not that pronounced as before Euro adoption. The real appreciation in the tradables sector becomes weaker. An increase of nontradables prices translates more easily into real appreciation when tradables prices are relatively

TABLE 3.23: Effects of Euro adoption on productivity-driven real exchange rate development

	RER (GDP deflator) (1)	RER (HICP) (2)	Relative prices (3)	RER (tradables) (4)
Productivity (T/N)/(T*/N*)	-.3545***	-.2519*	-.6809***	.0700
	(.1035)	(.1122)	(.0545)	(.0975)
DEuro*Productivity	-.5416	-.2309	-.2130	-.3258
	(.5094)	(.2187)	(.1549)	(.2954)
Consumption (N/T)/(N*/T*)	.8124*	.4026***	.2764	.5289**
	(.3789)	(.0821)	(.2619)	(.2104)
Consumption (L/B)/(L*/B*)	-.2743	-.1218***	.1280	-.3796**
	(.2092)	(.0371)	(.1018)	(.1298)
Government consumption	.3015	.2039	.2796	.1235
	(.4409)	(.1871)	(.2388)	(.2540)
L.Investment	.3572**	.1745**	-.0289	.3490**
	(.1530)	(.0564)	(.0606)	(.1276)
L.FDI	-.0630*	-.0302**		-.0438
	(.0304)	(.0129)		(.0278)
L.Openness	.2210	-.0930		.3059
	(.2058)	(.1148)		(.1894)
DCrisis	.0028	-.0119	.0429*	-.0485
	(.0508)	(.0194)	(.0227)	(.0433)
DEuro	-.0720	-.0148	-.1739**	.0506
	(.1568)	(.0711)	(.0536)	(.0889)
Constant	3.8969***	5.1976***	-.0881	3.3679***
	(1.1512)	(.5342)	(.1223)	(.9321)
Adj. R-Square	.6638	.7965	.7663	.5690
Observations	143	139	146	143
Hausman χ^2	239.97	90.68	67.30	59.03
Fixed/random effects	FE	FE	FE	FE

Source: Own calculations;
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation.

stable.

The next four regressions analyze the effect of Euro adoption on productivity-driven real appreciation as described by Balassa (1964) and Samuelson (1964) by including an interaction term between the productivity variable and the dummy variable for the introduction of the common currency. The results in Table 3.23 show that the Balassa-Samuelson effect on the overall real exchange rate does not change due to Euro adoption, at least not in the first years. The coefficients of the interaction term are insignificant both for the overall real exchange rate and its two components.

The regressions presented in Table 3.24 investigate the effect of Euro adoption on consumption-driven real appreciation. The introduction of an interaction term

TABLE 3.24: Effects of Euro adoption on consumption-driven real exchange rate development

	RER (GDP deflator) (1)	RER (HICP) (2)	Relative prices (3)	RER (tradables) (4)
Productivity (T/N)/(T*/N*)	-.3463***	-.2458*	-.6852***	.0733
	(.1045)	(.1143)	(.0502)	(.0985)
Consumption (N/T)/(N*/T*)	.7725*	.3841***	.2649	.5034**
	(.3826)	(.0854)	(.2650)	(.2110)
DEuro*Consumption (N/T)/(N*/T*)	.6562	.1965	.3668	.2566
	(1.4715)	(.7160)	(.2111)	(1.1387)
Consumption (L/B)/(L*/B*)	-.2649	-.1170**	.1266	-.3747**
	(.2085)	(.0375)	(.1002)	(.1312)
DEuro*Consumption (L/B)/(L*/B*)	.6736*	.3267**	.1806	.3870
	(.3267)	(.1278)	(.1026)	(.2543)
Government consumption	.2489	.1747	.2732	.0909
	(.4420)	(.1887)	(.2410)	(.2503)
L.Investment	.3236*	.1581**	-.0364	.3294**
	(.1461)	(.0553)	(.0638)	(.1271)
L.FDI	-.0659*	-.0315**		-.0455
	(.0298)	(.0130)		(.0272)
L.Openness	.1804	-.1158		.2811
	(.2062)	(.1136)		(.1949)
DCrisis	-.0052	-.0164	.0420	-.0538
	(.0493)	(.0182)	(.0231)	(.0421)
DEuro	.5005	.1960	.0891	.3231
	(.7501)	(.3626)	(.1015)	(.5905)
Constant	4.1184***	5.3202***	-.0918	3.5016***
	(1.1383)	(.5225)	(.1181)	(.9556)
Adj. R-Square	.6661	.7990	.7650	.5686
Observations	143	139	146	143
Hausman χ^2	169.18	84.73	128.50	1869.51
Fixed/random effects	FE	FE	FE	FE

Source: Own calculations;
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation.

between the consumption variables and the dummy variable for Euro adoption leaves the coefficients of the other explanatory variables mostly unchanged. The coefficient of the interaction term is insignificant with regard to consumption of nontradables relative to tradables. The coefficient of the interaction term between consumption of luxury relative to basic goods and the dummy variable for Euro adoption is, on the contrary, positive and significant in the regressions of the overall real exchange rate. The real appreciation as a result of shifting demand toward luxury goods diminishes after the introduction of the common European currency.

TABLE 3.25: Robustness check: Alternative measurement of consumption expenditure

	RER (GDP deflator) (1)	RER (HICP) (2)	Relative prices (3)	RER (tradables) (4)
Productivity (T/N)/(T*/N*)	-.4953***	-.3163***	-.8029***	.0161
	(.0923)	(.0919)	(.0661)	(.0822)
Luxury consumption	-.5789***	-.2510***	-.0432	-.5419***
	(.1572)	(.0481)	(.0959)	(.0973)
Government consumption	.1669	.2111	.1919	.0113
	(.4426)	(.1716)	(.2497)	(.3311)
L.Investment	.4600**	.2194***	.0000	.4246**
	(.1648)	(.0612)	(.0608)	(.1477)
L.FDI	-.0490	-.0231		-.0307
	(.0298)	(.0134)		(.0245)
L.Openness	.1324	-.1128		.2445
	(.2505)	(.1421)		(.2149)
DCrisis	-.0551	-.0386	.0003	-.0733
	(.0408)	(.0256)	(.0268)	(.0417)
Constant	1.6019	4.0871***	-.4744	1.2877
	(1.5317)	(.5516)	(.3852)	(1.2813)
Adj. R-Square	.6373	.7674	.7223	.5143
Observations	143	139	146	143
Hausman χ^2	57.43	24.71	30.08	37.21
Fixed/random effects	FE	FE	FE	FE

Source: Own calculations;
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation.

Alternative measurement of consumption expenditure

In the baseline models, consumption of luxury relative to basic goods and consumption of nontradables relative to tradables (both variables expressed relative to Germany) are used to assess the effect of the consumption structure on the RER development. The results indicate that a shift toward luxury tradable goods has induced a price increase in the sector of tradables. If this is true, then the effect can be captured by the level of luxury consumption (again relative to Germany) as well. Hence, in the next four regressions, the robustness of the results regarding the effect of a shift in consumption toward luxury goods is tested by replacing the variables used above by consumption of luxury goods and services relative to Germany. As shown in Table 3.25 the coefficient is negative and highly significant in the regressions of both the overall real exchange rate and the real exchange rate in the external sector. Increasing consumption of luxury goods and services is associated with real appreciation and the result is robust to different measurement of luxury consumption.

Time series analyses

The main findings from the previous subsection are reassessed in the following for the Czech Republic, Estonia, Hungary, Slovenia and Slovakia in time series analyses. The estimation for the other five countries considered in the panel analysis is not possible since data for these countries covers only a very short time span of less than 15 observations. Furthermore, the short time span makes it impossible to include all potential explanations of the real exchange rate. Thefefore, only the main determinants identified in the previous subsection are used as estimators in the time series analyses.

Tables 3.26-3.29 show the results of the time series analyses. As in the panel analyses above, the regressions of relative prices contain only driving forces of the internal real exchange rate. The regressions of the external real exchange rate contain potential supply-side explanations for the development of tradables prices relative to abroad but also some demand-side variables. As the panel analyses indicate, tradables real exchange rates are also driven by shifts in consumption demand since PPP is not fulfilled even in the external sector. To assure comparability with the panel regressions, the first column in each table represents the results from panel analyses with the same explanatory variables as in the time series analyses.

The results of the panel analysis of the overall RER can be confirmed by and large by the time series analyses. In the regressions of overall RER, the productivity variable has a significantly negative effect in the time series analyses for Estonia and Slovakia (only in the regression of HICP-deflated RER). In the regressions of relative prices (Table 3.28) the effect is stronger and the coefficient is significant in Estonia, Slovenia and Slovakia. The coefficient ranges between -0.42 and -0.98. In Hungary and the Czech Republic, the coefficient is correctly signed, though insignificant.

The effect of private consumption on the real exchange rate can be observed in all five countries. In Slovakia, Slovenia and the Czech Republic increasing consumption of tradables relative to nontradables is associated with real appreciation (positive coefficient of the corresponding variable in the regressions of overall RER based on HICP and/or GDP deflator). The positive coefficient is also confirmed in the regressions of relative prices. In the regressions of the external real exchange

TABLE 3.26: Explanations for the development of overall RER based on GDP deflator: Time series analyses

	Panel (1)	CZ (2)	EE (3)	HU (4)	SI (5)	SK (6)
Productivity (T/N)/(T*/N*)	-.3277*	-.1511	-.7580***	.2125	.0591	-.3023
	(.1555)	(.2093)	(.1713)	(.4438)	(.2980)	(.2033)
Consumption (N/T)/(N*/T*)	.8253**	1.0272**	.3036	.5331	-.0566	1.5231***
	(.3106)	(.3890)	(.1923)	(.4748)	(.3456)	(.4171)
Consumption (L/B)/(L*/B*)	-.2777	-.8675	-.3841**	-.7203**	-.3679**	-.5538*
	(.1721)	(.7775)	(.1669)	(.3034)	(.1557)	(.2663)
L.Investment	.2908	-.1619	-.1801**	.5108**	.2268**	-.1545
	(.1762)	(.4242)	(.0800)	(.2061)	(.0798)	(.1170)
L.FDI	-.0543	-.0495	-.0766***	.0106	.0115	.0380*
	(.0303)	(.0485)	(.0149)	(.0385)	(.0199)	(.0184)
Constant	4.9301***	5.0444***	4.6436***	4.4470***	4.3438***	4.4348***
	(.3000)	(.5717)	(.1992)	(.3785)	(.3050)	(.3299)
Adj. R-Square	.6575	.9159	.9420	.7707	.4259	.9729
Observations	143	19	18	17	17	15

Source: Own calculations;
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation in the panel regression.

TABLE 3.27: Explanations for the development of overall RER based on HICP: Time series analyses

	Panel (1)	CZ (2)	EE (3)	HU (4)	SI (5)	SK (6)
Productivity (T/N)/(T*/N*)	-.2831**	-.1451	-.4830***	-.3159	.1675	-.3854***
	(.1066)	(.1580)	(.0803)	(.3596)	(.1650)	(.0821)
Consumption (N/T)/(N*/T*)	.4997***	.4871***	.1725	.5705	.5845**	1.0740***
	(.1105)	(.1559)	(.1082)	(.4321)	(.2014)	(.1727)
Consumption (L/B)/(L*/B*)	-.1406**	-.4957	-.1267	-.5354**	.1230	.0443
	(.0448)	(.3888)	(.0767)	(.2310)	(.0771)	(.1069)
L.Investment	.1331**	-.1120	-.0736**	.4412**	-.0453	.0164
	(.0574)	(.2106)	(.0325)	(.1606)	(.0350)	(.0586)
L.FDI	-.0321**	-.0374	-.0318*	.0336	-.0164	-.0046
	(.0117)	(.0215)	(.0150)	(.0425)	(.0102)	(.0091)
Constant	4.7981***	4.8857***	4.5335***	4.1715***	5.0335***	4.9152***
	(.1269)	(.3102)	(.1113)	(.3315)	(.1996)	(.1151)
Adj. R-Square	.7855	.9119	.9106	.8630	.8167	.9869
Observations	139	17	17	17	16	15

Source: Own calculations;
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation in the panel regression.

TABLE 3.28: Explanations for real appreciation via increasing relative prices: Time series analyses

	Panel (1)	CZ (2)	EE (3)	HU (4)	SI (5)	SK (6)
Productivity (T/N)/(T*/N*)	-.7556***	-.2093	-.9775***	-.3166	-.4335**	-.4185***
	(.0785)	(.1262)	(.1750)	(.3091)	(.1666)	(.1237)
Consumption (N/T)/(N*/T*)	.2771	.6233***	-.1774	.7331*	.8043***	.2749
	(.2176)	(.1327)	(.1855)	(.3568)	(.1898)	(.3810)
Consumption (L/B)/(L*/B*)	.0671	-.2467	-.4920**	.1242	-.0965	-.5244***
	(.1163)	(.2319)	(.1634)	(.2250)	(.0735)	(.1617)
L.Investment	-.0583	-.0499	-.0919	.1611	-.1305*	-.1703
	(.0851)	(.1589)	(.0861)	(.1576)	(.0667)	(.1324)
Constant	-.1255	.0313	-.7813***	.0537	.2660*	-.2526
	(.1258)	(.1360)	(.1735)	(.2046)	(.1451)	(.2538)
Adj. R-Square	.7316	.9485	.8526	.7341	.9301	.9573
Observations	146	19	18	17	18	16

Source: Own calculations;
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation in the panel regression.

TABLE 3.29: Explanations for real appreciation in the tradables sector: Time series analyses

	Panel (1)	CZ (2)	EE (3)	HU (4)	SI (5)	SK (6)
Consumption (N/T)/(N*/T*)	.3464	.1001	.5783***	.1477	-.0439	1.2274
	(.2419)	(.2182)	(.0476)	(.3142)	(.3424)	(.6763)
Consumption (L/B)/(L*/B*)	-.4930**	-1.2384**	.0967*	-.8022***	-.0894	-.2152
	(.1666)	(.4835)	(.0446)	(.1719)	(.1799)	(.4306)
L.Investment	.1864	-.4021	-.1334**	.1869	.0576	-.0779
	(.1079)	(.2585)	(.0448)	(.1744)	(.1128)	(.3013)
L.FDI	-.0023	-.0011	-.0386***	.0239	.0228	.0521
	(.0170)	(.0258)	(.0069)	(.0437)	(.0163)	(.0360)
Private sector share	1.0080**	-1.7356**	-.2138	-.8809	.5897**	-.8189
	(.3330)	(.7503)	(.3182)	(.5959)	(.1893)	(2.4585)
Constant	.0700	12.0480***	6.0159***	8.1444***	1.8885**	8.0527
	(1.6007)	(3.3969)	(1.3629)	(2.5049)	(.6592)	(1.2529)
Adj. R-Square	.4155	.8850	.9474	.7626	.7894	.8593
Observations	145	17	17	15	16	15

Source: Own calculations;
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation in the panel regression.

rate, though, the coefficient is insignificant.

In Hungary, Estonia and Slovenia, a shift of overall consumption toward luxury goods affects the real exchange rate development and leads to appreciation of the overall real exchange rate (based on either HICP or the GDP deflator). The effect of luxury consumption on RER in the tradables sector can be confirmed for Estonia, Hungary and the Czech Republic. The coefficient is negative for most of the countries, though not significant.

Contrary to the other explanatory variables discussed above, the effect of investment demand differs from country to country. The coefficient in the regressions of overall RER is significant and positive in Hungary and Slovenia, negative in Estonia and insignificant in Slovakia and the Czech Republic. The same holds true for the coefficient of private sector share in GDP in the regressions of external RER. The coefficient is significantly positive in Slovenia, negative in Czech Republic and insignificant in Estonia, Hungary and Slovakia.

To sum up, the time series analyses confirm that productivity and shift in private consumption are important explanations for the real appreciation in transition economies. Furthermore, they also indicate that the effect of other variables like investment demand and private sector share in GDP is rather weak and not present in all countries. This result underlines the advantage of panel analysis in cases where only short time series are available. Pooling data across several countries is an usefull tool to increase the power of econometric analysis. However, it does not allow for identifying developments that are specific to one particular country.

3.5 Concluding remarks

The impossibility to fulfill simultaneously the criteria for exchange rate and price level stability appears to be a serious problem for the countries of Central and Eastern Europe because of the sustained RER appreciation. The plans of Lithuania and Estonia (both joined the exchange rate mechanism ERM2 in June 2004) to adopt the Euro along with Slovenia were revised because the inflation criterion could not be met. Estonia initially postponed the accession to the EMU to January 2008 but later changed its target date to January 2011. The Bank of

Lithuania has announced a new plan for Euro adoption in 2015. Sizeable difficulties in controlling inflation were also the main problem in Latvia (joined ERM2 in May 2005), where the Euro adoption was initially planned for the beginning of 2008 but in 2006 was postponed until the beginning of 2014. Hungary, Poland and the Czech Republic have not joined the ERM2 yet, although in 2005 all three countries announced their plans to adopt the Euro in 2010, 2009 and 2010, respectively. One year later these plans were revised and Euro adoption is not to be expected in the near future in these countries.

The present analysis shows the real exchange rate development is mainly driven by productivity growth and by shifts in the composition of total demand. Therefore, it would be premature to conclude that the real appreciation will no longer characterize the development of the CEEC, as the transition process is mostly over. The shift of production factors toward more efficient industries, the emergence of the nontradables service sector, and the increasing productivity coming from this development, as well as further transition-specific factors, are becoming less important. On the other side, the slowdown of the productivity growth in the nontradables sector will reinforce the magnitude of the Balassa-Samuelson effect. In the long term, the real exchange rate is expected to be driven mainly by factors accompanying the process of real convergence, like productivity growth in the tradables sector.

Besides the fulfillment of the Maastricht criteria, a further concern among authorities associated with the real appreciation has often been the loss of competitiveness in the tradables sector (see e.g. Oomes 2005). This concern is due to the fact that most of the transition economies show considerable current account deficits in the last years. Though, this current account deficits are not surprising since they are a corollary of net capital inflows. The countries of Central and Eastern Europe have attracted a large amount of foreign investment. Furthermore, as pointed out in Chobanov and Sorsa (2004) and Oomes (2005), the real appreciation should not be a big deal regarding competitiveness as long as it has been driven by productivity advances and quality improvements. The present analysis indicates, that productivity development is one important explanation for the overall real appreciation.

TABLE 3.30: Further results

	RER (GDP deflator) (1)	RER (GDP deflator) (2)	RER (HICP) (3)	RER (HICP) (4)
Productivity (T/N)/(T*/N*)	-0.3738**	-0.2867	-0.1926*	-0.1135
	(0.1614)	(0.2646)	(0.0993)	(0.1410)
Consumption (N/T)/(N*/T*)	0.5390*	0.5790***	0.3898**	0.3037***
	(0.2583)	(0.1475)	(0.1250)	(0.0512)
Consumption (L/B)/(L*/B*)	-0.2845	-0.2034	-0.1408*	-0.0925***
	(0.2333)	(0.1191)	(0.0730)	(0.0227)
Government consumption	0.1416	0.5295	0.0901	0.3312*
	(0.4567)	(0.3496)	(0.1949)	(0.1707)
L.Investment	0.2533	0.1305	0.1804*	0.0916
	(0.2220)	(0.1318)	(0.0969)	(0.0646)
L.FDI	-0.0923	-0.0421*	-0.0438**	-0.0218*
	(0.0528)	(0.0230)	(0.0172)	(0.0107)
L.Openness	0.2762	0.1563	-0.0102	0.0213
	(0.3419)	(0.1415)	(0.1251)	(0.0590)
Private sector share	0.6759***	1.2724**	-0.0519	0.4637**
	(0.1664)	(0.3938)	(0.1124)	(0.1914)
Administered prices (Eurostat)		-0.0529		-0.1283**
		(0.1122)		(0.0540)
Administered prices (EBRD)	0.0837		-0.1326**	
	(0.1838)		(0.0481)	
DCrisis	-0.0264	-0.0354	-0.0328	-0.0567***
	(0.0366)	(0.0328)	(0.0251)	(0.0168)
Constant	0.6500	-1.1171	5.4994***	3.2935***
	(1.6896)	(1.6727)	(0.4085)	(0.7679)
Adj. R-Square	0.5483	0.6565	0.7626	0.7792
Observations	109	110	109	110
Time span	1996-2009	2001-2011	1996-2009	2001-2011
Fixed/random effects	FE	FE	FE	FE

Source: Own calculations;
*/**/*** significant at 10%/5%/1%;
Standard errors in parentheses, adjusted for heteroscedasticity and autocorrelation as well as for cluster specific serial correlation.

Chapter 4

Explanations for the political trust in national and European political institutions

4.1 Introduction

Since the economic turbulences in the second half of 2008, the political process in the European Union has been shaped by a range of unprecedented events and discussions. After numerous unpunished cases of violation of the Stability and Growth Pact, it now appears that the no-bailout clause incorporated in Article 125 of the Treaty on the Functioning of the European Union can be reinterpreted in a way that allows for several of the solvent countries to be liable for the commitments of other member states with insufficient fiscal discipline. Justification has been provided even for the purchases of government bonds of financially stricken countries by the seemingly independent European Central Bank. The discussion about Eurobonds, which will irrevocably cross out the no-bailout clause, is still vivid, and further plans for transferring competencies to the European level of governance are already in operation. The previous is not surprising, since it is well documented in the literature that "centralization ... breeds further centralization" (Beer 1973: 75), and that bureaucracies expand simply because they exist (Parkinson 1957).[1] It is surprising, however, for this process of further centralization to experience significant acceleration in times, when trust in European governmental

[1] Vaubel et al. (2007), for instance, investigate staff growth in international organizations and show that the elasticity of staff to membership is much larger than unity (1.36).

institutions reaches its historical minimum. Whereas in 2007 three out of four respondents to the Eurobarometer survey tended to trust European institutions (Eurobarometer 67), this number has been steadily decreasing in recent years. At the end of 2011 only one out of three respondents trusted the European Commission and the Council of the European Union (Eurobarometer 76). Therefore, trust in the European institutions converges to the traditionally lower level of trust in national institutions in many EU member states.

The downturn of popular trust in governmental institutions is accompanied by a sharp decline in political participation, as reflected by voter turnout. In Germany and France, for instance, the voter turnout in national elections decreased by over 20 percent in the period 1970-2010, from 90 percent to 70 per cent in Germany, and from 80 per cent to 60 per cent in France.[2] The turnout of the latest elections in 2009 regarding the European Parliament was about 22 per cent lower in Germany and the Netherlands than the turnout of the elections thirty years ago. Meanwhile it is questionable if the members of the European Parliament can be considered representatives for their electorate, since turnout data shows that in some countries, especially in Eastern Europe, less than one out of three eligible voters do in fact cast their votes.[3]

The number of common policy fields within the European Union is increasing but there is still a lack of transparency with regard to the decision-making process at EU level. Just like in any international organization, the European citizens are quite distant from the governing institutions - both in a direct and figurative sense. The preferences of the political actors at EU level differ strongly from those of the representative voter (Schmitt/Thomassen 1999, Vaubel 2009). Using data from the European Elite Survey performed by the University of Sienna in 2006 (University of Sienna 2006), Vaubel (2009) shows that EU-related opinions of the general public strongly differ from the opinions of top Commission officials and members of the European Parliament.[4] Lack of transparency of the decision-making process within the European institutions, the large spatial distance between the institutions and the voters, as well as the extended chains of delegation are all legitimate

[2]According to data from the International Institute for Democracy and Electoral Assistance (IDEA).

[3]For instance the voter turnout of the 2009 elections for European Parliament was 28 per cent in the Czech Republic, 24.5 per cent in Poland, 27.6 per cent in Romania, 28.3 per cent in Slovenia, and even 19.6 per cent in Slovakia.

[4]A further survey performed by Gallup (1996) shows that both national civil servants and parliamentarians are "more EU-minded than citizens" (Vaubel 2009, p. 56).

reasons for the prevalent belief among the citizens that they have less influence at the EU than at the national level (Eurobarometer 44.1, Nov./Dec. 1995). This principal-agent problem in the structures of the European Union explains why many EU citizens show less confidence in the European Parliament than in the national parliaments (Norris, 1999).

The aim of the present chapter is to analyze the driving forces of popular trust in national and European governmental institutions. The empirical evidence thus far shows that there is a range of economic factors, which are important for the process of trust-building and trust-maintenance (see e.g. Roth et al. 2011, Muñoz et al. 2011). Parameters such as GDP growth and unemployment tend to influence the level of political trust, since they are important indicators for the performance and, therefore, the trustworthiness of governmental institutions. However, the existing empirical literature has not considered one important aspect of the process of trust-building and trust-maintenance, namely the nature and particular characteristics of the relationship between the voter as principal and the political institutions as agent. As in every principal-agent relationship, the principal is more likely to trust the agent if more information about the way the agent fulfills his assignment is available and/or if the principal has more control over the actions of the agent.[5]

This chapter consists of two main parts. The first part is devoted to the differences in political trust at European and national level. The concept of relative political trust is introduced and its determinants are further analyzed. Empirical investigation based on individual data from Eurobarometer offers explanations for the different levels of trust in European institutions compared to their national counterparts. The results indicate that socio-cultural and performance-based factors, perceived benefits and principal-agent problems explain the level of trust in national relativ to European institutions.

In the second part driving forces of popular trust in national and European institutions are analyzed since the breakout of the current economic crisis and compared to the pre-crisis period. The panel analysis is based on semiannual data from the Eurobarometer survey. The empirical analysis investigates the determinants of trust in the national parliament and national government on the one hand, and

[5]About principal-agent problems in international organizations in general see Vaubel (2006).

European Parliament, European Commission and Council of the European Union on the other. An allowance for a structural break at the beginning of the current economic crisis was made. The empirical results of the current analysis confirm the role of important economic indicators. Furthermore, they confirm the importance of the principal-agent problem for the trust building process with regard to governmental institutions. When the economy runs smoothly, for instance, people tend to trust the European and the national institutions more, if they understand the way the European Union works. In times of crisis, however, the sign of the relationship is reversed, and the results indicate that people who understand the politics of the European Union find its institutions even less trustworthy. This result indicates that in times of crisis people indeed became increasingly dissatisfied with the political system of the European Union.

The chapter is organized as follows: The next section offers an overview of the theoretical background for the process of trust-building and trust-maintenance. Section 4.3 presents the empirical analysis of trust in national relative to European institutions. Section 4.4 is devoted to the panel analysis of trust in national and European political institutions during the current economic crisis. A summary of the results and some concluding remarks are presented in section 4.5.

4.2 Theoretical background of political trust

4.2.1 Literature review of explanations for the level of political trust

The initiation of the systematic theoretical analysis of the process behind trust-building and trust maintenance with regard to political authorities goes back to the 1960s and the early 1970s when an abrupt decline in the political trust among US citizens was observed. A much quoted and fairly controversial paper by Arthur Miller (1974) has often been considered as the leadoff to significant analysis of political distrust in US society.[6] Miller interprets the prevalent political discontent and alienation not only as a threat for the political authorities but also as endangering the whole political regime. A critical reading of Miller's view on the political

[6]See e.g. Abramson (1983).

situation was almost immediately published by Citrin (1974) who argued that the lack of political support among US citizens is addressed rather toward the political authorities and the current incumbents, and its interpretation as endangering the political system as a whole can be seen as "*premature, if not misleading*" (p. 978). In response Miller released further supporting arguments for his view and concluded:

> "*The trend toward increased distrust, therefore, reflects growing dissatisfaction and discontent with the performance of government in the US.*" (Miller, 1974a, p. 992)

Further foundation for the systematic analysis of political trust is provided by David Easton in a series of publications about the concept of political support (Easton, 1965, 1975, Easton and Dennis, 1969). Easton draws a distinction between specific support on the one hand, which is directly related to the current satisfaction that members of a system possess with regard to the perceived political and economic performance of the authorities; and diffuse support on the other hand, which can be considered as a "*reservoir of favorable attitudes or good will*" toward the governing authorities since it is rather based on the long-term experience with the authorities and is thus independent from the output and performance in the short run. According to Easton's conception, diffuse support will typically express itself in two forms: in the belief in the legitimacy of the political authorities and the regime as a whole, and in political trust. Easton defines trust in Gamson's terms as "*the probability* [...] *that the political system (or some part of it) will produce preferred outcomes even if left untended*" (Gamson, 1968, p. 54) and detects the sources of the level of political trust in the process of socialization as well as in the experience with the authorities over time. Easton (1975) stresses that the political and economic performance of the authorities can be considered as a determinant, both of the specific and the diffuse support and thus of the level of trust among the members of the system and the legitimacy of the political regime. While the specific support is directly related to the current outcome of the authorities, it is the experience aggregated over time that determines the level of diffuse support.

In accordance with the foregoing considerations by Easton, the theoretical explanations for political trust can be broadly classified into two main groups: socio-cultural and political-economic. Socio-cultural theories provide a wide range of

sociological as well as social-psychological determinants for the trust-building process and are also applicable for most of the political attitudes. The main conclusion is that political attitudes are the result of the early life experience and thus can be influenced by factors such as age, education level, gender and socioeconomic status (e.g., Almond and Verba, 1963, Easton, 1975, and Ingelhard, 1990). Therefore, the explanations for the process of trust-building and trust-maintenance delivered by the socio-cultural theories are by and large exogenous for the political system and can only indirectly and to a certain extent be influenced by the political and economic performance of the authorities.[7]

The conventional political-economic explanations for the level of political trust are mainly based on the perceived performance of the political authorities. Higher level of political trust is the result of a steadily positively judged experience with the authorities and the political system as a whole (Miller, 1974, Easton, 1975, Rogowski, 1974, Weatherford, 1989), whereas both the economic and the political performance of the authorities are considered as key factors. However, it is worth noting that it is not the outcome of the authorities itself, but rather the perception about their performance that determines trust among the members of the political system, since individuals do not respond to reality on its own, but to their subjective perception of reality (Lewin 1936). This fact is also recognized by Dalton and Eichenberg (1994) in their analysis of the public support for the European integration process:

> "*In general it is more important to know what Europeans think about economic conditions rather than to measure the economy in objective terms.*" (Dalton and Eichenberg, 1994, p. 20, in Marsh, 1999)

Their consideration motivates Marsh (1999) to include the variable "*perceived economic improvement*" in his empirical analysis of the satisfaction with EU politics among the European citizens.

In well-established democracies the perceived economic performance of the government as measured by the perception about the overall economic conditions as well as the individual material well-being are important explanations for a wide

[7] While factors such as gender and age are independent from the political outcome, factors like socioeconomic status or education level can be indirectly affected on average by the performance of the political authorities.

range of political attitudes and especially for the level of political trust (Lewis-Beck 1988). However, Clarke et al. (1992) demonstrate that besides the economic output of the authorities, the perceived political performance of the government is a further significant driving force of the process of trust building in society. It can be expected that the sense of e.g. security, respect of human rights, equality or compliance with the law is going to stimulate political trust among the members of the political system.

Early analyses show that political trust is the result of accumulated positive evaluation of the performance of the system or the governmental institutions (Easton and Dennis 1969). However, the measurement of the overall performance of political institutions is hardly possible. Furthermore, in times of economic crises it is the performance in economic terms which is actually expected to drive considerably the level of popular trust in governmental institutions. Hence, the performance of the institutions reflected by the prevailing economic situation (as measured by leading economic indicators or the perception of the economic situation captured by the responses to survey questions) should positively affect the level of political trust in national institutions. Roth et al. (2011) deliver some directly related support for this hypothesis. Using Eurobarometer data they show that the increasing distrust in national institutions is related to an increase in unemployment in the EU-15. Furthermore, in the EU-27 increasing levels of public debt contribute to the decrease of net trust both in national and European governmental institutions.

The analysis by Muñoz et al. (2011) provides some indirect evidence about the effect of performance of governmental institutions on the level of political trust. The main question of their analysis concerns the relationship between trust in national and trust in European institutions. The starting point of the study is the existing controversy in the literature regarding the sign of this relationship. On the one hand, Sánchez-Cuenca (2000) and Kritzinger (2003) suggest that confidence in national institutions hinders trust in their European counterparts, since the trust-building process involves the evaluation of the performance of the particular institutions. A positive evaluation of the performance of national institutions, and therefore higher trust level with regard to the national institutions, mean higher costs of transferring sovereignty to the EU level of government and lower trust level in European institutions (Sánchez-Cuenca 2000). Kritzinger (2003) delivers a slightly different argument for the negative relationship: As a sign of protest citizens tend to express higher confidence in European institutions if they do not

trust the national counterparts. Muñoz et al. (2011) refer to these arguments supporting the negative relationship between trust in national and European institutions as the "compensation" model. On the other hand, Kritzinger (2003) applies the "equal assessments" model developed by Anderson (1998) and argues that EU citizens can also show higher trust levels in the European institutions if they trust the national institutions, demonstrating a positive relationship between both trust levels. As an explanation Anderson (1998) and Kritzinger (2003) stress the fact that citizens possess very low levels of information and knowledge about EU politics and therefore base their opinions on domestic attitudes. If satisfied with the performance of national institutions they tend to trust institutions in general and therefore exhibit higher levels of trust in European institutions. Furthermore, since national institutions are more or less directly involved in the EU architecture, it is possible that trust in national political institutions is transferred to their European counterparts. This argument, which Muñoz et al. (2011) referred to as the "congruence argument", is also supported by the analyses by Medrano (1995) and Rohrschneider (2002). Using data from the European Social Survey Muñoz et al. (2011) provide evidence both for the compensation and the congruence argument: They argue that high confidence in the national parliaments positively impacts the trust in the European Parliament at individual level (congruence); however, being citizen of a country with relatively high aggregated confidence level with regard to the national parliament means heaving less confidence in the European Parliament (compensation).

Although the analysis of the relationship between trust in national and trust in European institutions can be tainted by the problem of common cause interdependence, it delivers some valuable insights about the controversy, which dominates the effect of improving economic conditions on trust in European institutions. If the citizens of the European Union use the performance of national institutions as a proxy for the performance of their European counterparts, then the expected sign of the relationship between economic performance and trust in European institutions is the same as in the case of trust in national institutions. However, if better performance of the national economy hampers the support for transferring competencies to European governmental institution, then it is possible to observe the reverse sign with regard to the European institutions as well. The evidence by Roth et al. (2011) supports the first hypothesis, since low growth levels of GDP per capita and high public debt are associated with declining trust in the European Commission and the European Parliament in times of crisis. However,

it should be kept in mind that the opposite sign is likewise possible.

4.2.2 Explanations based on the principal-agent problem

The literature related to the level of political support and especially political trust offers mainly sociological factors and factors based on the perceived economic and political performance as determinants for the level of trust toward political institutions. A further range of explanations for the trust level can be found in the circumstances surrounding the relationship between the members and the authorities of a political system. General trust and in particular political trust can be viewed as the result of the perceived future activities of the person or the authority under consideration:

> "*To say that I trust you means I have reasons to expect you to act, for your own reasons, as my agent.*" (Hardin, 1999, S. 26)

If the members of the political system as principals strongly believe that their agents - the political authorities - pay attention to their interests, they are more likely to exhibit a higher level of trust. However, it is more often than not the case that political institutions and incumbents have their own vested interests, which differ from those of the representative voter. As a consequence, the level of political trust will decline with an increasing perceived magnitude of the divergence between the interests of the authorities and the members of the political system.

The intensity of the principal-agent problem described thus far can be influenced by a wide range of important factors. To some extent it is captured by the perceived performance of the political authorities: if the citizens evaluate the performance of the authorities affirmatively, it is very likely that they would assess the actions of the political agents as if they were in their own interest. A positive experience with the political authorities over time will thus smother the problem. However, the favorable performance of the political agents does not solve the problem since it is founded on the information asymmetries between the principal and the agent. Long chains of delegation, lacking communication and information facilities, the large distance between the majority of the citizens and the seat of the authorities can all be used as explanations for lacking political trust and even

political alienation despite high political and economic performance. Furthermore, the feeling that one's voice has only a negligible weight and that the citizens cannot influence the political process at all is also expected to be negatively linked to the political trust among the members of the political system. The consequences of the principal-agent problem between the voters and the political authorities can thus be further used to explain the level of political trust among the members of the political system.

It is well documented that people are very poorly informed about the role and the common practices within the European governmental institutions. According to Eurobarometer data in 2011 69 per cent of the respondents consider themselves as fairly badly or very badly informed about the European Parliament's sphere of work (EB Parlemeter 74.3). In 2007 43 per cent believed that the European Parliament has the greatest decision-making power within the European Union, as opposed to 14 per cent for the European Commission and ten per cent for the Council of the European Union (Special Eurobarometer 288). According to the same issue of Eurobaromter only 48 per cent of the respondents are aware that the members of the European Parliament are directly elected by the citizens of the EU. In the Czech Republic, Sweden and the Netherlands actually the prevailing opinion is that members of the European Parliament are not directly elected.

This information asymmetry is the constituent element of the principal-agent problem between the median voters as principals and the governmental institutions as agents. Information costs and limited control mechanisms explain the fact that a considerable share of the population is rationally ignorant as regards the political process. Although the principal-agent problem is also present with regard to the national institutions, it is more severe with respect to the European government, since the relationship between the voters as principals and some of the European institutions as agents is tainted by a principal-agent problem at more than one stage of delegation (see Vaubel 2006, Vaubel et al. 2007). In the case of the European Commission citizens of parliamentary democracies, for instance, elect in the first instance their national parliaments, which choose the national executive (two-stage principal-agent problem up to this point). The members of the European Commission are then chosen by the President (nominated by the European Council, thus from the Heads of State or Government of the member states) from candidates put forward by the EU member states. The list of Commissioners must

then be approved by the Council of the European Union and the European Parliament. The Council of the European Union is composed of several configurations of representatives of the national governments elected by the national parliaments. This would include two stages of delegation if all members of the Council were (at least indirectly) elected by all citizens of the European Union. According to the structure of the Council, however, the two-stage principal-agent problem exists between the citizens of a member state and only one of the members of the Council, namely the one representing their home country (dependent upon the topic of discussion). The election of other members can be considered not in the control of the median voter of each country. Among the European institutions only the European Parliament is directly elected by the citizens of the EU member states. However, as the Eurobarometer data has shown, the voters are neither informed about the role of this institution nor are they really aware of the way the members of the European Parliament get elected.

As Vaubel has pointed out, the information asymmetry between international organizations and their principals is due to high information cost and weak incentive to be informed (Vaubel 2006). Besides the long chains of delegation, there is a range of circumstances which intensify this problem. Large distance between the seat of the European institutions and the citizens of the European Union as well as language barriers increase the cost of information gathering compared to the case of national institutions. Furthermore, the median voter has only a weak incentive to collect information and to look for possibilities to exercise control, since the centralization of policies at the European level reduces the scope for comparison of the performance of European institutions, the so-called "yardstick competition". As Eurobarometer data further demonstrates, the respondents believe to have only marginal possibilities of influencing the political process at European level. At the end of 2011 only one out of four respondents tend to agree with the statement "My voice counts in the EU." (Eurobarometer 76), and this trend has being decreasing.

All those aspects of the principal-agent problem breed distrust among the citizens of the European Union, and the severity of the problem explains the fact that trust in the European Union decreases faster than trust in national institutions. The European level of government was embraced with hope at the beginning of the integration process, especially in countries where the level of trust in national institutions has been traditionally low, such as Italy and the countries of Central

and Eastern Europe.[8] The current economic crisis brought about a lot of disenchantment, and the optimism in these countries to have the problems of their national governmental systems solved by transferring competencies to European authorities has significantly decelerated. It becomes more and more questionable if centralization can be justified at all, since lacking knowledge and understanding for the EU policy and only weak control mechanisms are expected to breed further distrust among the EU citizens. This hypothesis will be subject to the empirical analysis of the following section.

Figure 4.1 summarizes the theoretical explanations for the process of trust-building and trust-maintenance with regard to national and European political institutions. Socio-cultural and political-economic explanations for political trust should not be considered as competing theories. They should rather be used as complements in empirical analyses of the determinants of the trust level as regards the political authorities.

[8]See also Martinotti and Stefanizzi (1995, p. 176 f) for the case of Italy, and Mishler and Rose (1997) for the countries of Central and Eastern Europe.

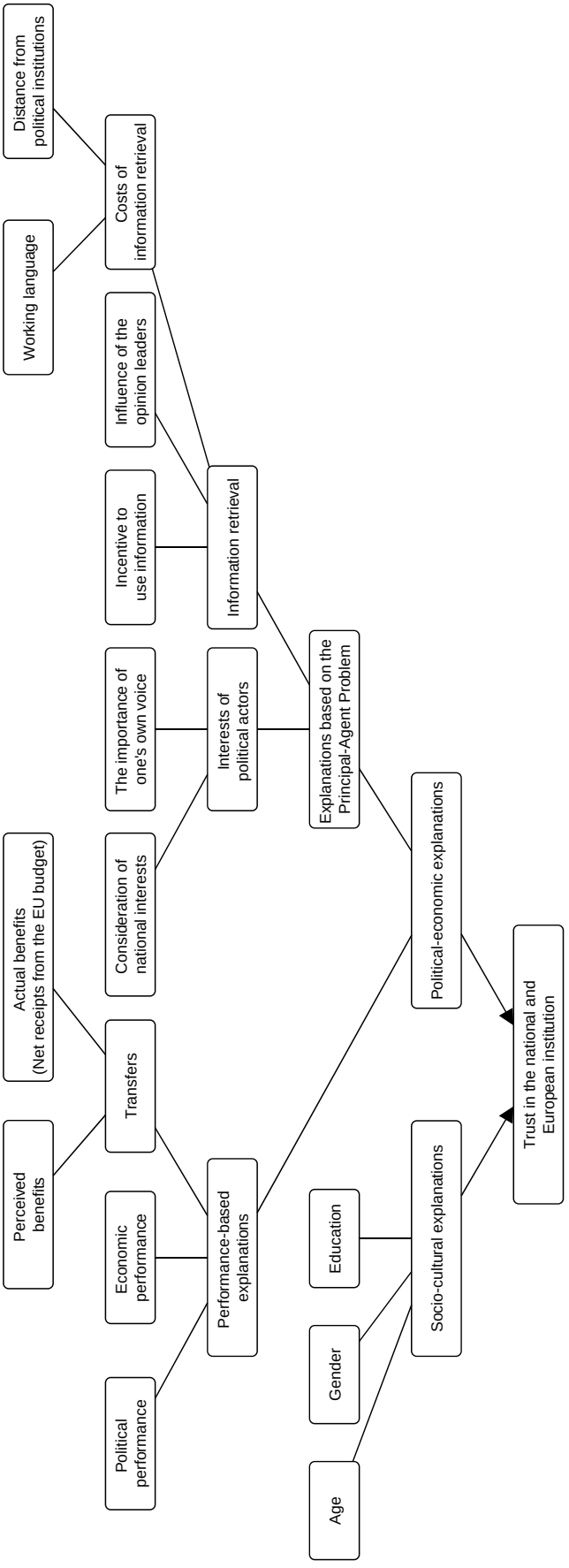


FIGURE 4.1: Theoretical explanations for the trust in national and European political institution

4.3 Explanations for the political trust in national relative to European institutions[9]

4.3.1 The concept of relative political trust

The theoretical explanations presented in the previous section are aimed at explaining the level of trust attended to a specific political authority and demand an adequate adjustment in order to be applied as explanations for the relative trust in national compared to the corresponding European institutions.

For the purpose of the present analysis the relative trust is defined as the difference between the level of trust toward the national institution and the trust level expressed by the respondents with regard to the European counterpart of the institution under consideration. Higher levels of relative trust can thus be observed if the citizens of the member states are more likely to trust the national institution and/or express less confidence[10] in the corresponding European institution. Relative trust amounting to zero is the result of equally high or low levels of confidence with regard to both the national and to the European institution. This approach allows explanation factors to be left out which affect the political trust over the level of general trust and should have a similar impact on the confidence in the national as well as in the European institution.[11]

While most of the socio-cultural driving forces of the political trust described above are expected to have similar effects on the confidence in the authorities both at national and European level and should thus cancel out when implied for the variable in relative terms, it is also possible that some personal characteristics can influence the level of relative trust. Norris (1999) offers some confirmation of this hypothesis in her empirical analysis of public support of the European political regime. In accordance with the empirical evidence thus far, she presumes that young people as well as more highly skilled people are likely to express more

[9] The analyses presented in this section were conducted in 2007.

[10] In the following the word *confidence* is used synonymously with the word *trust*.

[11] For instance, if we assume a positive influence of the overall life satisfaction on the political trust via the channel of the general trust, this factor can be excluded from the analysis of the relative trust, since it would affect the confidence both in the national and the European institution alike. One important exception is the case in which the overall satisfaction is caused by the outcome of a specific political authority. However, under these circumstances its effect should be captured by the perceived performance of the authority.

support for the idea of a united Europe, while older people and those with a lower level of education show more nationalism and conservatism and thus less support for the European political regime. The effect of the socio-cultural aspect is captured in her empirical analysis by the variables of gender, age, social status, and the education level measured as the number of years of education. All four variables turn out to have a strongly significant effect on the level of support for the European political regime. Although the support for the idea of a united Europe and the political regime is a different concept from that of the relative trust as defined above, it is very likely that the socio-cultural background can also be used as an explanation for the level of relative trust among European society.

While the socio-cultural variables can be directly included in the empirical analysis of relative trust, the political-economic explanations need an adjustment in order to obtain the variables in relative terms. In the case of the political-economic driving forces of political trust, an appropriate approach is to use a relative variable expressed as the ratio between the value for the national institution and for its European equivalent, or in the case of a discrete scale, such as in most of the social surveys, as the difference between the two values.

The significance of the political and the economic performance as an explanation for public support with respect to European integration or the European political regime has already been tested. Dalton and Eichenberg (1991, 1993) observe a significantly positive correlation between the evaluation of the country's economic performance and the support for EU membership. As a further explanatory variable they propose the intra-EC exports of a country as a fraction of its total exports, a variable which turns out to have a significantly positive impact on the support for EU membership too. Vaubel (1993, 1994) confirms the results regarding the effect of trade integration and also finds a significantly positive correlation between the net receipts from the EC budget and the support for the European unification. In this context it can be expected that a higher level of political support and in particular of political trust as regards the European institutions should be observed for citizens who expect some benefits from the EU membership of their home country. This argument is in accordance with the definition of general trust proposed by Hardin (1999) and Easton (1965, 1975).[12] If the European institutions contribute with their own activities to the interests of the population of an EU member state, then they should appear to be trustworthy to the citizens

[12]See the preceding section.

of this particular country. One possibility to capture this effect is to use the net receipts of the country from the budget of the European Union, as in the analysis by Vaubel (1994). Moreover, as a further measure the subjective opinion of the citizens with respect to the benefits of their own country from its EU membership can be used, since the present chapter makes use of data at individual level in the empirical part.

The relative performance of the political institutions is a plausible explanation for the differences in relative trust especially as regards the cross country comparison. A notable discrepancy in the level of relative trust is observed in particular between the "old" 15 EU member states and the newcomers. Vaubel (2009) points out that eastern Europeans have much more confidence in European institutions like the European Parliament, the Council and the Commission than in their national counterparts. In the style of Martinotti and Stefanizzi (1995, p. 176 f), the sources of the different levels of trust can be found in the lacking satisfaction of the peoples of the Central and Eastern European countries (CEEC) regarding their political and economic situation, just as Italians expect an opportunity for reform and overcoming the deficits in their present political system from the new regime of a united Europe. In the same spirit, Mishler and Rose (1997) view the low levels of political trust in the CEEC as a result of the dissatisfaction with the economic performance. As regards the political aspect, it is rather optimism in view of the future and a positive evaluation of the political performance compared to the communist background that prevails in public political attitudes. An explicit comparison of the level of relative trust in the new EU member states and EU-15 is provided in the next subsection.

While the relative performance shows sizable differences between the countries, this is less the case with the principal-agent problem and its implications for the relative political trust. The principal-agent problem in the working process of the major European institutions exhibits similar intensity with regard to most of the member states. It is a common characteristic of all international organizations, and hence, of the European Union as such, that the principal-agent problem is intensified by longer chains of delegation between the voters as principals and the agent in comparison to other private and public organizations (Vaubel, 2006). The political actors have vested interests which differ from those of the representative citizen. They are interested in the survival and growth of their organization, which can be ensured by expanding competencies, a larger budget and increasing staff

numbers in spite of a constant or even shrinking output. However, not only the diverging interests of the principal and the agent constitute the problem; further determinants of the principal-agent problem can be found in the lack of control on the part of the voters[13] and the poor communication between the institutions at EU level and the population. European citizens are less informed about the polity and the working mechanisms of the European institutions than about those of their national counterparts, and it is not surprising to observe a positive relationship between their understanding and knowledge of EU politics and the relative trust in favor of the European institutions. As Sobel (2006, p. 432) puts it, "*in a world of uncertainty, people often 'prefer the devil they know to the devil they don't know'*".

The large distance between most of the citizens of the EU and the European institutions, the working languages of the institutions that differ in most of the cases from those of the voters, and the lacking transparency with regard to the decision-making process are all factors which increase the information costs of the European citizens (Vaubel, 1994). High information costs, as well as the large electorate and the indirect kind of democratic control have reduced the incentive of the individual citizen to search for information sources about European affairs (Aranson, 1990, Vaubel, 1986, and Teutemann, 1991 in Vaubel, 1994).

Beichelt et al. (2006) describe the problem as a discrepancy between the various tasks of the political institutions and the opportunities for the citizens to contribute to the fulfillment of the tasks and thus to be represented in the institutions. Moreover, recalling Eastons's (1965, 1975) distinction between specific support and diffuse accumulated trust, the lack of a long-lasting commitment to the political regime can be seen as a threat for the political institutions and their legitimacy in times of crises (Miller, 1974, Kielmannsegg, 1996).

[13]There is not much scope for the EU citizens to "vote by the feet" or to compare the output of the European institutions with European rivals, as such are almost lacking.

4.3.2 Empirical analysis

4.3.2.1 Definition of the variables and a first look at the data

The data for the empirical analysis is taken from Eurobarometer 65.1, which was collected in spring 2006. It covers the 27 member states of the EU and consists of 24,693 relevant records.[14]

The dependent variables

Two political institutions are considered in the analysis, parliament and the government. The respondents' trust in the national institutions is measured by their answers to the following question:

> QA10: I would like to ask you a question about how much trust you have in certain institutions. For each of the following institutions, please tell me if you tend to trust it or tend not to trust it.
>
> 3) the (NATIONALITY) Government
>
> 4) the (NATIONALITY) Parliament

A corresponding question was also asked with respect to the European institutions. Following Norris (1999), the European government is represented by the European Commission and the Council of the European Union:

> QA25: And, for each of them [the following European bodies], please tell me if you tend to trust it or tend not to trust it?
>
> 1) The European Parliament
>
> 2) The European Commission
>
> 3) The Council of the European Union

In both questions there are two response alternatives: "tend to trust" and "tend not to trust". The values of the responses were converted into dummy variables where the answer "tend to trust" takes the value of one. In order to measure

[14]The complete dataset consists of 29,170 available records. However, not all of them are from EU member states.

the **relative** trust in favor of the national political institutions, two variables were generated by subtracting the value of the response to question QA25 from its corresponding counterpart of question QA10. The trust level with regard to the European government is calculated as an average of the response values to subquestions QA25_2) and QA25_3). The variables thus generated, the dependent variables for the empirical analysis, represent the difference in the trust level of the respondents in the national and European Parliament on the one hand (*rel_trust_parl*), and in the national and European government, on the other hand (*rel_trust_gov*).

The variable *rel_trust_parl* can take three values: 1, if the respondent has shown more trust in the national relative to the European Parliament; 0 in the case of equal trust levels; and -1, if the political trust in the European Parliament is higher than that one regarding the national parliament. Figure 4.2 illustrates the distribution of the relative political trust in the parliament. Over 60 percent of all respondents have exhibited equal trust levels in the national and in the European institution, while almost 30 percent tend to trust the European rather than the national parliament. This result is mainly due to the respondents from the twelve new EU countries, which show in more than 40 percent of the cases more trust in the European than in the national parliament. The corresponding explanation was given in the previous section.

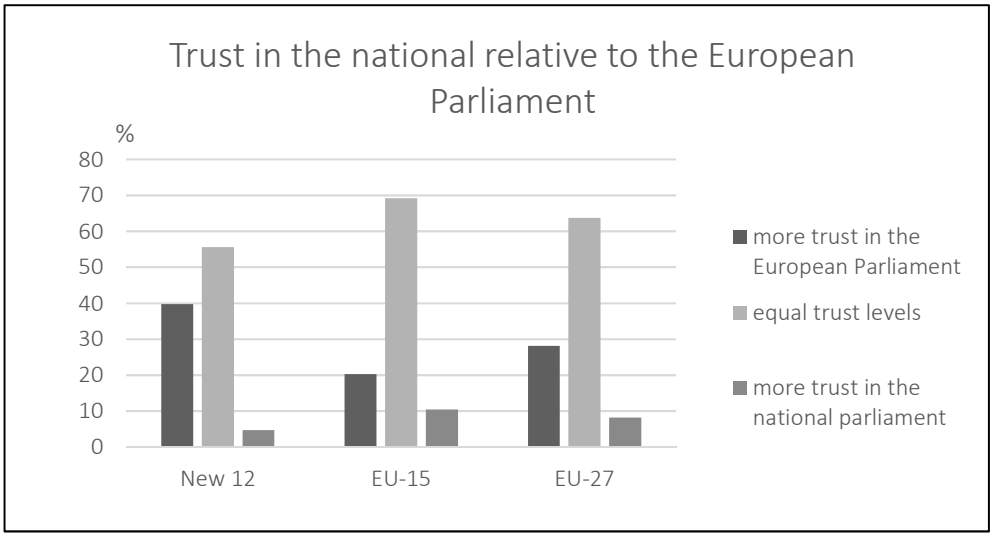


FIGURE 4.2: Trust in the national relative to the European Parliament

Source: Eurobarometer 65, Spring 2006

The variable for the political trust in the national relative to the European government can also take integral values between -1 and +1. Subtraction of the average of the responses to the subquestions QA25_2) and QA25_3) from QA10_4) yields one of the following values: -1; -0.5; 0; 0.5; 1. However, as 0.5 and -0.5 were not accepted by the statistical software as ordinal variables, the cases with values 0.5 and -0.5 were added to those with values 1 and -1 since both imply more and respectively less trust in the national relative to the European government.[15] The variable *rel_trust_gov* exhibits a distribution similar to the relative trust in parliaments (see Figure 4.3). About 60 percent of the respondents show equal trust in both the national and the European government, represented by the European Commission and the Council of the European Union. More than 30 percent trust the European government rather than the national one, where this fraction is higher in the twelve new EU member states.

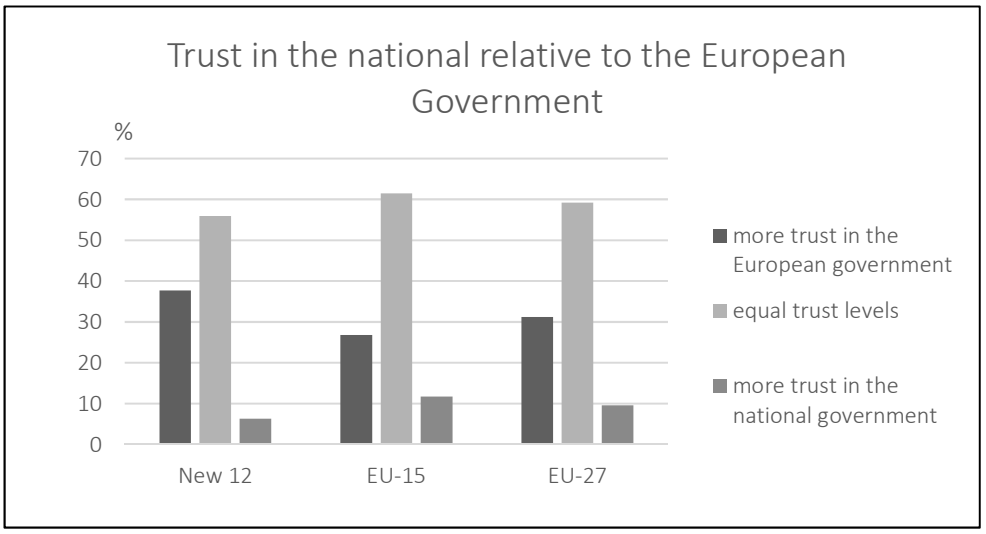


FIGURE 4.3: Trust in the national relative to the European government

Source: Eurobarometer 65, Spring 2006

[15] Alternatively, the values could be doubled to achieve a five-step scale with whole numbers. However, this makes the interpretation of the empirical model much more complicated. If the parallel line assumption is violeted (see below), then the empirical results contain four coefficients per explanatory variable. In the case of three-step scale only two coefficients have to be reported if the parallel line assumption is violated. Therefore, in the present analysis a three-step scale was chosen. This approach not only assures easier interpretation of the results. It also makes the results of the empirical analysis of relative trust in government comparable to those with regard to parliament.

The explanatory variables

As an approximation for the perceived divergence between the performance of national and European political institutions, question QA34 was used to capture the satisfaction with the political performance and question QC1 as a measure for the perceived economic performance:

> QA34a: On the whole, are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the way democracy works in (OUR COUNTRY)?
>
> QA34b: And how about the way democracy works in the European Union?
>
> QC1: How would you judge the current situation in each of the following?
>
> 1) The situation of the (NATIONALITY) economy
>
> 2) The situation of the European economy

A four-step scale was applied for the responses to these questions, and for the purpose of a better interpretability the primary outcomes were transformed as follows: The value of one was ascribed to the response "not at all satisfied" for question QA34 and "very bad" for question QC1, and the maximal value of four was given to "very satisfied" and "very good" respectively. The variables capturing the perceived relative performance (*rel_perf_econom* and *rel_perf_politic*) were generated by subtracting the values for EU performance from those for the home country. Thus, negative (positive) values indicate better (worse) performance of the European Union as compared to the home country of the respondents. The hypothesis to be examined in the empirical analysis is that the variables for the relative performance have a positive influence on the level of relative trust, as a better performance of the national relative to the European institutions should lead over time to higher relative trust as defined in the previous section. Figure 4.4 illustrates the distribution of the two variables capturing the relative performance. Over 60 percent of the respondents exhibit similar satisfaction with the way democracy works at both national and European level. In the new member states almost 30 percent show a higher satisfaction with the European than the national democracy. By contrast, the respondents from the EU-15 are on average more satisfied with the way democracy works at the national level.

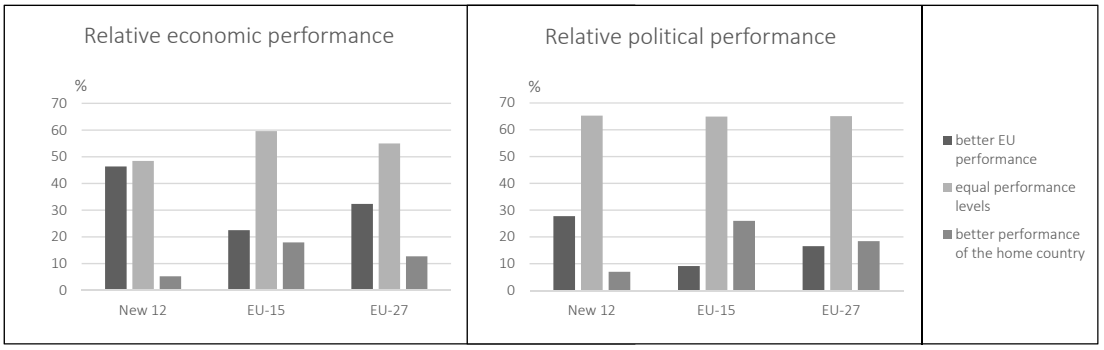


FIGURE 4.4: Relative political and economic performance

Source: Eurobarometer 65, Spring 2006

As for economic performance, the distribution of the perceived relative performance is even more striking. About 50 percent of the respondents from all countries in the survey evaluate the situation of the national economy and the European economy alike. However, almost 50 percent of the respondents from the new EU member states are of the opinion that the economic conditions in their home countries are not as good as in the European economy as a whole. It is thus possible that this voters hope for better economic conditions from EU membership.

Two variables are used to estimate the effect of the benefits from the EU membership on relative political trust. The first variable, net receipts per capita from the EU budget in 2006 (*receipt*), is calculated from data published in the financial report of the European Commission (EC, 2007). Data about the population is taken from Eurostat. Bulgaria and Romania are excluded from the analysis when the net receipts per capita are used as an explanatory variable, since reliable data on net receipts is not yet available for these countries.

The effect of the perceived benefits for a country from being a member of the European Union is captured using the following question:

> QA 12: Taking everything into account, would you say that (OUR COUNTRY) has on balance benefited or not from being a member of the European Union?

A dummy variable named *country_benefit* was built from the responses to this question. It takes the value one if the respondent has answered the question positively ("benefited") and zero otherwise. As shown in Figure 4.5, about 65 percent of the respondents believe that their home country has benefited from being a member of the European Union.

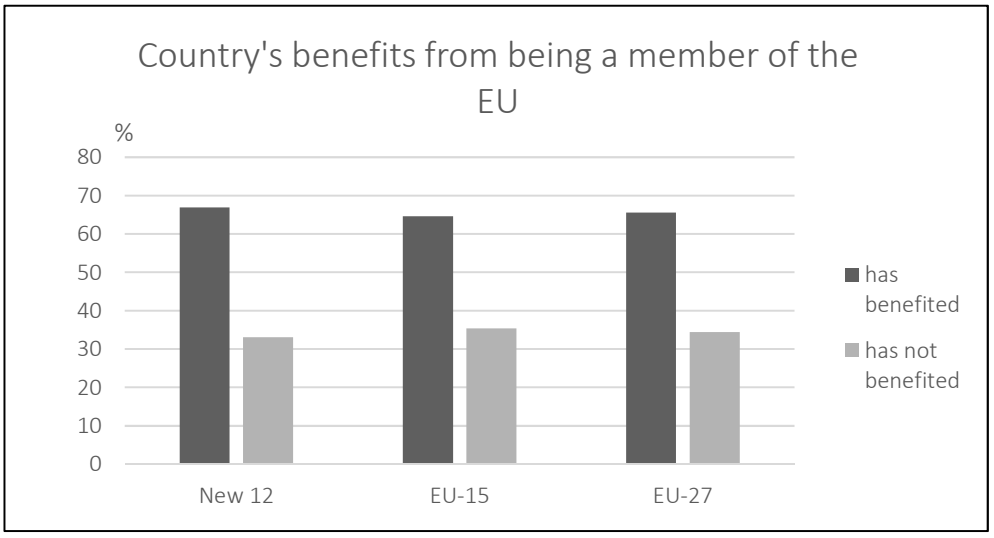


FIGURE 4.5: Perceived benefits for the home country from being a member of the EU

Source: Eurobarometer 65, Spring 2006

The expected sign of the coefficients of both variables is negative, since the benefits from EU membership should be associated with a higher level of trust in the European institutions.

In order to capture the effect of the political interest and the knowledge about European issues and affairs on the relative political trust, the following three questions were used:

> QA1: When you get together with friends, would you say you discuss political matters frequently, occasionally, or never?
>
> QA15: Please tell me for each statement, whether you tend to agree or tend to disagree.
>
> 5) I understand how the European Union works.

QA26: For each of the following statements about the European Union could you please tell me whether you think it is true or false?

1) The European Union currently consists of fifteen Member States.

2) The members of the European Parliament are directly elected by the citizens of the European Union.

3) Most of the European budget is spent on administrative and personnel costs.

The answers the respondents gave to the first question show to what extent they are interested in political matters. The variable was labelled *pol_discuss* and a three-step scale was used, whereas the value of one was given to the response "never" and the value of three respectively to "frequently".

The second question (QA15) is used to establish the extent to which the respondents believe that they understand the way the European Union works. Hence it is the subjective opinion of the respondents about their knowledge with regard to the European institutions and their tasks. The responses were converted into the dummy variable *understand*, where the value one has been ascribed to "tend to agree", therefore to the case in which the respondents think they understand how the European Union works.

The objective of question QA26 was to acquire the actual knowledge of the respondents as regards the European Union and some certain facts surrounding it. One point was given for every correct answer and the responses to the three subquestions were additively aggregated to form the variable *knowledge*, which takes integer values between zero and three and can be used as an index for the objective knowledge of the respondents about the European affairs. Surprisingly, the partial correlation between the variables *understand* and *knowledge* turned out to be relatively low (0.139), which allows both variables to be included in the empirical analysis. The low correlation coefficient indicates that the perceived EU knowledge of the respondents widely diverge from the actual one.

The expected sign of the coefficients of all three variables is negative, since, reminiscent of Sobel (2006), people tend rather to trust the institutions which they are more familiar with. However, the sign may also be positive because a better

level of knowledge and more discussion on political topics enables the respondents to be more critical as they posses more understanding both for the positive and the negative aspects of the matter.

The distribution of the variables *pol_discuss*, *understand* and *knowledge* is shown in Figure 4.6. It does not distinguish between the respondents from the EU-15 and the twelve new EU member states because the differences are negligible.

Although over 80 percent of the respondents discuss political topics with friends at least occasionally, almost half of all participants state that they do not understand the way the European Union works. Furthermore, almost 40 percent can give only up to one correct answer in question QA26, and only about 20 percent of the respondents answered all three questions correctly.

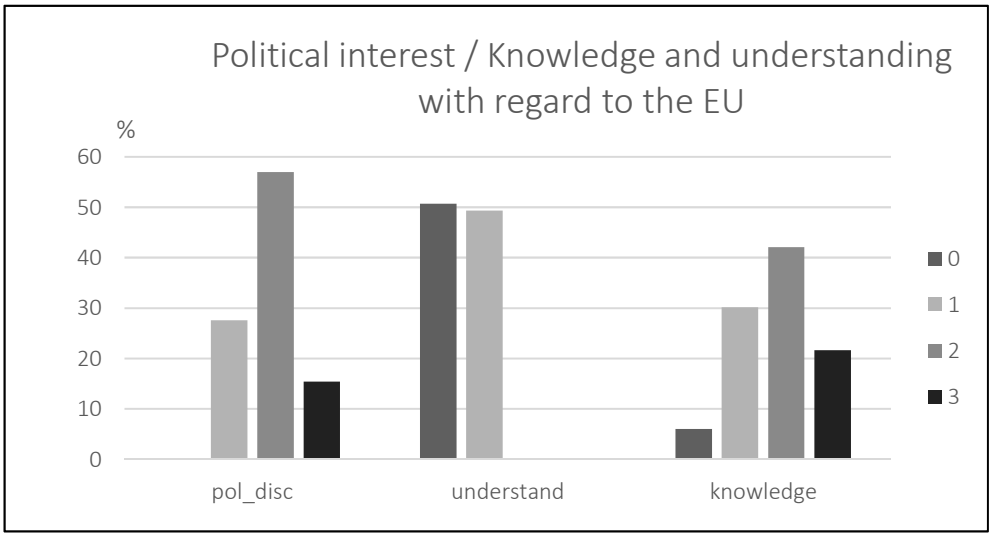


FIGURE 4.6: Political interest / Knowledge about the EU

Source: Eurobarometer 65, Spring 2006

The next three variables capture the intensity of the principal-agent problem. The first variable (*distance*) is a measure for the geographical distance between the institutions and the citizens of the European Union, approximated as the distance between Brussels and the capital of the home country of the respondent.[16]

[16]The data used for this variable originates from www.map24.de. A more appropriate measure would be the relative distance, as measured by the difference between the distance from the national and that from the European institutions. However, due to missing data only the distance between the capital of the home country and Brussels could be applied.

The dummy variable *language* was used to check for a potential effect of the foreign working languages of the European institutions on the relative political trust. The variable takes the value of one if the mother tongue of the respondent differs from the working languages of the European institutions, and zero otherwise.

The third proxy for the principal-agent problem is the sum of the responses to the following three parts of question QA15:

> QA15: Please tell me for each statement, whether you tend to agree or tend to disagree.
>
> 4) My voice counts in the European Union.
>
> 6) The interests of (OUR COUNTRY) are well taken into account in the European Union.
>
> 7) (OUR COUNTRY) will become more influential in the European Union in the future.

As regards the first subquestion, one would wish to use the difference between these answers and corresponding values for the home country to explain relative trust. However, as comparable data for the home countries is missing, it has to be assumed that the voice of the respondents counts to the same extent in all countries.

All three subquestions were integrated into one variable, since the bivariate correlation between each two of them exceeds the value of 0.5. As in the case of the variable *knowledge*, one point has been given to every response of "tend to agree" and then the points are summed to generate the variable *voice*. This variable can then take discrete values between zero and three and accounts for the opportunities of the residents and their home countries to influence political events at the European level. The distribution of this variable is represented in Figure 4.7. Almost one third of all respondents have given the answer "tend to disagree" to all three subquestions, which can be interpreted as a clear sign of a principal-agent problem. However, the respondents from the twelve new EU member states are less pessimistic, especially with regard to the third subquestion. Most of them believe that the influence of their home country within the European Union will

increase, especially in Estonia, Poland, Romania and Slovenia.[17]

The expected coefficient for the variable *voice* is negative, since higher values correspond to more control at the EU level, which then increases trust in the European institutions.

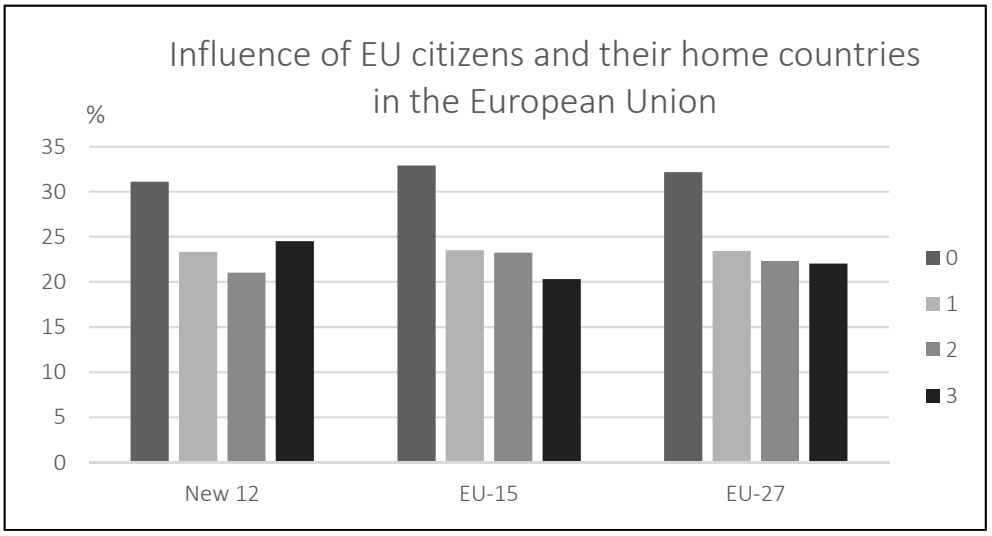


FIGURE 4.7: Influence of EU citizens and their home countries in the European Union (*voice*)

Source: Own calculations based on data from Eurobarometer 65, Spring 2006, increasing values indicate lower intensity of the problem

The influence of the opinion leaders on trust has been proxied by the variable capturing the perceived distortion of the image of the EU in the media. For this purpose the answers to the subquestions of the following question are used:

QA22: Do you think that the (NATIONALITY)

1. television;
2. radio;
3. press

presents the European Union too positively, objectively or too negatively?

For each subquestion the value zero is given to the answer "objectively", and the value one to both "too positively" and "too negatively", as both responses imply a

[17]Of course, a better measure for the purpose of the present chapter would be the perceived current influence of the country. However, this question has not been asked.

distortion. An aggregation over the answers with respect to all three media results in the variable *image* capturing the overall perception of the distorted image of the EU in the media. It can take four values beginning at zero if the respondent holds that no medium distorts the image of the EU and ending at three in the case that the respondent perceives the image of the EU in all three media as distorted. Figure 4.8 shows the distribution of this variable. Over 60 percent of the respondents do not observe a distortion of the EU image in the media. However, more than 20 percent of the participants hold that the representation of the EU is biased in all three media.

The expected coefficient for the variable image is positive, since higher values indicate that the respondents perceive the available information about the EU in the media as not trustworthy.

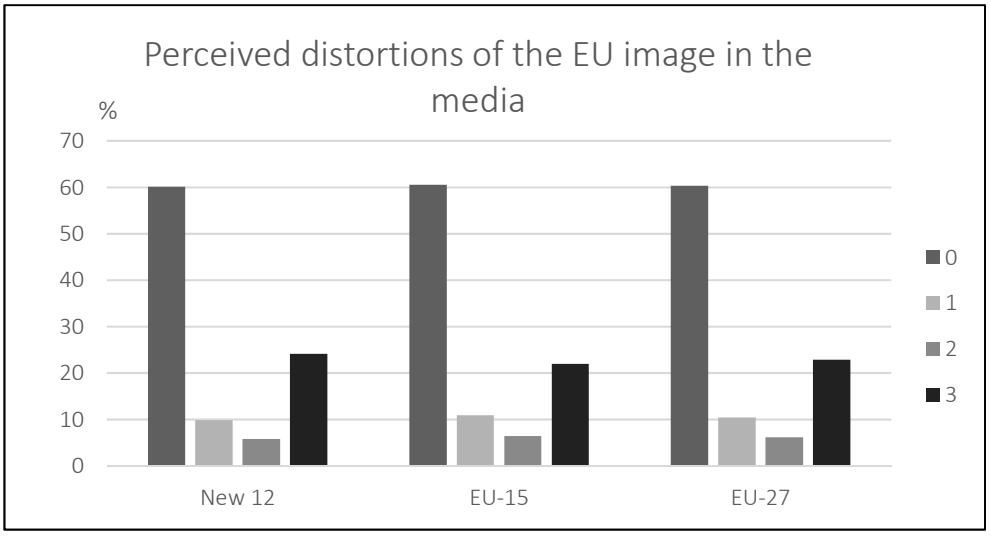


FIGURE 4.8: Perceived distortions of the EU image in the media

Source: Eurobarometer 65, Spring 2006

The variables *age*, *sex* and *education* were applied as control variables in order to capture the socio-cultural aspects. The dummy variable for the gender takes the value one for male and zero for female respondents. The variable *education* can take three values: one, in the case in which the respondents have completed their last education levels by the age of 15; two, if the last education level was graduated at an age between 16 and 19; and three for a higher education level. The potential effect of the length of EU membership of the home country of the respondent (in years) on the relative trust was estimated by using the variable *membership*. In

accordance with Vaubel (1994), the expected sign of this variable for the EU-15 is negative, since the countries in which EU membership and generally European unification is more popular were probably the first to join and their citizens will thus express more confidence in the European institutions.

4.3.2.2 The method of the empirical analysis

The empirical analysis of the relationship between several exogenous variables and a single dependent variable is normally performed as an OLS estimation of a linear regression equation. However, this widely used and very transparent empirical method is applicable only in the case of a metrically scaled dependent variable. The empirical analysis of a variable measured on a nominal or an ordinal scale entails some problems of a mathematical and statistical nature (see e.g., Pampel, 2000, pp. 3 ff.). The dependent variable, just to mention one of them, has mostly only a small number of possible values (in the case of the relative political trust three), so it is impossible to approximate the distribution of the residuals by the normal distribution.[18]

An appropriate method for empirical analysis of a nominally or an ordinally scaled dependent variable is instead the multinomial logistic regression analysis (MLR). Following Norušis (2007, p. 69 ff.) and Baltes-Götz (2006), the present section offers an overview of the estimation procedure using the variable *rel_trust_parl*, and the empirical results are subsequently presented.

Contrary to conventional linear regression analysis, MLR delivers estimates for the so-called "odds" instead of the probabilities for the occurrence of a particular event. A reference category should be chosen, e.g. $Y(= rel\_trust\_parl) = 0$.[19] The following equation is then estimated for the remaining two values of the variable *rel_trust_parl* using the Maximum Likelihood method:

$$ln\left(\frac{P(Y=j)}{P(Y=0)}\right) = \beta_j X, \tag{4.1}$$

[18] For further discussion on the shortcomings of the linear regression analysis of ordinally and nominally scaled dependent variables see Pampel (2000).

[19] $rel\_trust\_parl = 0$ is the case of equal trust in the national and European Parliament.

whereas

$$j = -1, 1; \beta_j := [\beta_{j0}, \beta_{j1}, ..., \beta_{j0}]; X = \begin{bmatrix} 1 \\ X_1 \\ X_2 \\ ... \\ X_M \end{bmatrix}$$

M denotes the number of the independent variables, and the logarithm on the left hand side of the equation is the odd for the occurrence of $Y = j$ (in the example $j = 1$ or $j = -1$) relative to the case of $Y = 0$. The interpretation of the estimated coefficients should be accordingly adjusted as compared to the linear regression model. The following example should shed light on the specificity of the interpretation when using MLR as method of the empirical analysis. Let's assume that the estimation for the value of $Y = 1$ delivers the coefficient $\beta_{11} = 0.5$. The outcome for the regression coefficient means that an increase of X_1 by one unit leads to a higher probability ratio between the probability for the occurrence of relative trust amounting to one and respectively amounting to zero $\left(\frac{P(Y=1)}{P(Y=0)}\right)$. The new value of the probability ratio can be calculated by multiplying the old one by the factor $e^{1 \cdot 0.5} \approx 1.65$. Thus, the probability ratio increases by the factor $e^{\beta_{11}}$ when the value of X_1 rises by a unity. A positive coefficient for the variable X_m means respectively that the relationship between X_m and the probability ratio is positive, since $e^{\beta_{j,m}} > 1$. The output of the statistical software delivers in most of the cases both the values of the estimated coefficients β_{ji} and the values of $e^{\beta ji}$.

A special case of MLR is given when the dependent variable is ordinally scaled (Ordinal Logistic Regression, OLR). An adjustment can be made as compared to the odds estimated by MLR to facilitate the interpretation of the estimated coefficients. The probability ratios are built as follows:

$$\theta_1 = \frac{P(Y = -1)}{P(Y > -1)} \tag{4.2}$$

$$\theta_2 = \frac{P(Y \leq 0)}{P(Y > 0)} \tag{4.3}$$

Unlike the procedure of MLR, in OLR only one equation is estimated, as it is assumed here that the different values of the ordinally scaled dependent variable are associated with different intercepts, but the slope coefficients remain unchanged. This approach allows for an appropriate interpretation of the estimated

coefficients: A positive coefficient implies, like in the OLS regression, a positive relationship between the corresponding independent and the dependent variable. The estimation procedure should then be continued by testing for parallel lines assumption using a Brant-test (see e.g., Long and Freese 2006), thus verifying the hypothesis of equal slope coefficients above all categories of the dependent variable. A rejection of the null hypothesis can be considered as evidence for an incorrectly made assumption of parallel lines and the OLR estimation should be adjusted accordingly. One possibility is to use the MLR estimation irrespectively of the ordinal scale of the dependent variable. Although straightforward, this approach delivers regression coefficients with a fairly complicated interpretation if one wants to stick to the ordinal character of the variable. Instead of this, Generalised OLR (GOLR) can be applied (see e.g., Fu, 1998 and the extension by Williams, 2007), which includes a testing procedure for parallel lines and allows for different slope coefficients when necessary.

A further specific characteristic of international survey data which has to be accounted for in the empirical analysis is the way the data was collected. The features arising from the design and the data collection procedure concern mainly sampling weights, clustering of the individuals and stratification of the sample (see e.g., StataCorp, 2007). In the present analysis they have been accounted for by weighting the individual responses in accordance with the population of the country they come from and by the number of interviews taken in each country. Furthermore, the whole survey has been divided into clusters using the individual member states.

4.3.2.3 Results of the empirical analysis

Trust in the national relative to the European parliament

Table 4.1 shows the empirical results for the relative trust in parliament. In the first regression the variables *receipt*, *distance*, *language* and *membership* as well as the dummy for the EU-15 are not included, and these country specific characteristics are captured by the country dummies. In the following five regressions the country dummies are excluded and the other country specific variables are considered one at a time to avoid extreme multicollinearity. In the last regression the

variable *receipt* is used to capture the effect of the benefits from the EU membership instead of the variable *country_benefit*. Where two coefficients are reported the Brant-test showed that the parallel line assumption was violeted. A significantly positive (negative) value of the upper coefficient indicates that increasing values of the explanatory variable raises (decreases) the probability of having relative trust amounting to zero or one against the probability of having relative trust amounting to -1. A significantly positive (negative) value of the lower coefficient indicates that increasing values of the explanatory variable raises (decreases) the probability of having relative trust amounting to one against the probability of having relative trust amounting to -1 or zero. In both cases the coefficients can be interpreted as evidence of existing positive (negative) effect of the explanatory variable on the dependent variable.

In all six regressions the coefficient of the variable *rel_perf_politic* turned out to be positive and highly significant. According to the hypothesis, the respondents tend to trust the European parliament more than its national counterpart if they are more satisfied with the way democracy works in the EU than in their home country. As regards the situation of the economy at national and European level, the coefficient of the variable is significant only in the first and the fifth column of Table 4.1. However, the effect of the difference in the economic conditions on the relative trust can express itself in the belief that the home countries of the respondents obtain, or do not obtain, net benefits from being a member of the European Union. Although the coefficient of the variable representing the effect of the net receipts from the EU budget in the last regression is not significant, the coefficient of the perceived benefits from EU membership is highly significant and has the expected negative sign in all regressions. In accordance with the theoretical considerations, the European Parliament tends to be more trustworthy than the national parliament if the respondents believe that their home countries have benefited from being a member of the EU.

TABLE 4.1: Political trust in the national relative to the European Parliament

	rel_trust_parl (1)	rel_trust_parl (2)	rel_trust_parl (3)	rel_trust_parl (4)	rel_trust_parl (5)	rel_trust_parl (6)
rel_perf_politic	.298 (.000)***	.543(.000)***	.532 (.000)***	.467 (.000)***	.359 (.000)***	.591 (.000)***
	.501 (.000)***			.633 (.000)***	.567 (.000)***	
rel_perf_econom	.127 (.019)**	.110 (.203)	.107 (.229)	.115(.249)	.133 (.047)**	.158 (.092)*
country_benefit	-.423 (.008)***	-.412 (.001)***	-.399(.001)***	-.367 (.003)***	-.357 (.007)***	
pol_discuss	.001 (.989)	-.034 (.640)	.017 (.777)	.043 (.562)	.050 (.518)	.042 (.479)
	.215 (.000)***	0.187(.007)***		.169 (.027)**	.170 (.018)**	
understand	-.160 (.216)	-.153 (.271)	-.157 (.244)	-.161 (.243)	-.161 (.239)	-.185 (.231)
knowledge	-.115 (.086)*	-.128 (.069)*	-.121 (.070)*	.117 (.107)	-.099 (.168)	-.131 (.117)
	.084 (.211)	.082 (.293)	.087 (.219)	.080 (.311)	.086 (.261)	.083 (.301)
voice	-.013 (.744)	-.019 (.647)	-.019 (.649)	-.027 (.511)	-.018 (.611)	-.064 (.165)
	-.333 (.000)***	-.345 (.000)***	-.343 (.000)***	-.345 (.000)***	-.339 (.000)***	-.405 (.000)***
image	.058 (.367)	.070 (.228)	.069 (.249)	.069 (.253)	.062 (.335)	.087 (.174)
age	-.002 (.278)	-.001 (.553)	-.001 (.478)	-.001 (.492)	-.001 (.334)	-.001 (.347)
sex	.072 (.230)	.085 (.144)	.079 (.166)	.074 (.221)	.057 (.329)	.064 (.312)
education	.002 (.860)	.001 (.906)	-.005 (.475)	.001 (.870)	.005 (.593)	-.009 (.306)
			.017 (.044)**			.012 (.224)
distance		-.0003 (.025)**				
		-.000 (.222)				
language			.251 (.211)			
membership				.009 (.095)*		
d_eu15					.945 (.000)***	
receipt						-.000 (.167)
cons	1.744 (.000)***	1.929 (.000)***	1.710 (.000)***	1.518 (.000)***	.997 (.000)***	1.705 (.000)***
	-2.100 (.000)***	-2.017 (.000)***	-2.360 (.000) ***	-2.591 (.000)***	-3.167 (.000)***	-2.306 (.000)***
Adj. R-squared	.1164	.1025	.1066	.1106	.1259	.0995
No	8472	7976	7976	7976	7976	7345

p-values in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%; the parallel line assumption (i.e. equal slope coefficients above all categories of the dependent variable has been violated where two values are reported - the first value refers to the reference -1, the second to the reference 0); R^2 value refers to an OLS estimation; rel_trust_parl (1) with country-specific intercepts, see Table 4.2.

The coefficient of the variable *understand* turned out to be insignificant in all specifications. The coefficients of the variables *knowledge* and *pol_discuss* show significant coefficients either for the first or for the second reference value of relative trust. The coefficient of the variable *knowledge* is significant only at the 10-percent level in the first three specifications. The results can be interpreted as weak evidence that respondents who discuss political matters more frequently as well as those who exhibit less knowledge about European issues are more likely to trust the national than the European Parliament. Although there is no conclusive effect of this aspect of the principal-agent problem on the relative trust in the parliament, there are further aspects that show more affirmative results. Particularly, the variable *voice* exhibits a negative and highly significant coefficient in all six regressions for the reference value $rel\_trust\_parl = 0$. This implies that the respondents tend to trust the national but not the European Parliament if they feel that their interests or those of their home country are not well taken into account in the European Union.

The variable capturing the distortion of the EU image in the media as well as most of the control variables regarding socio-cultural factors show in most of the specifications no significant effect on the relative trust in the parliament. Only the variable *education* has partly significant positive coefficients for the second reference value indicating higher trust in the national relative to the European Parliament among better educated respondents. One possible explanation is the fact that the knowledge of foreign languages is positively correlated with the level of education.

The coefficient of the variables for the impact of the large spatial distance between the principals and the agents and for the effect of the length of the EU membership are partly significant but wrongly signed. Probably this is due to the fact that no country dummies were included and these variables capture the negative influence of being a citizen of one of the new EU member states on relative trust in parliament, since these are mostly countries which are quite distant from Brussels. The coefficient of the difference between the working languages of the European institutions and the mother languages of the respondents turned out to be not significant. This result is at least partly surprising since all three variables exhibit correctly signed and highly significant coefficients if the observations are not clustered and weighted.

TABLE 4.2: Country-specific intercepts in the regression rel_trust_parl (1)

ger	-.050 (.182) -.413 (.000)***	gre	-.254 (.000)*** -1.112 (.000)***	spa	.512 (.002)*** .002 (.971)
fra	.299 (.000)*** .020 (.708)	ita	-.056 (.176) -.521 (.000)***	ire	.901 (.000)*** .249 (.000)***
lux	.107 (.002)*** -1.350 (.000)***	den	1.175 (.000)*** .090 (.252)	net	-.043 (.036)**
uk	.297 (.000)*** .192 (.000)***	por	.826 (.000)*** .057 (.242)	aus	1.073 (.000)*** .146 (.018)**
swe	.002 (.969) -2.135 (.000)***	fin	.660 (.000)*** .262 (.000)***	cyp	.592 (.000)*** .205 (.000)***
cze	-.926 (.000)*** .096 (.072)*	est	-.470 (.000)*** -.917 (.000)***	hun	-.909 (.000)*** -1.032 (.000)***
lat	-.107 (.000)*** .358 (.000)***	lit	-.273 (.000)*** -1.019 (.000)***	mal	-.810 (.000)*** -.926 (.000)***
pol	-1.332 (.000)*** -1.874 (.000)***	slovak	.342 (.000)*** -.236 (.010)***	sloven	-1.224 (.000)*** -.671 (.000)***
bul	-.845 (.000)*** -1.168 (.000)***	rom	-.363 (.000)*** -.819 (.000)***		

p-values in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%;the parallel line assumption (i.e. equal slope coefficients above all categories of the dependent variable has been violated where two values are reported - the first value refers to the reference -1, the second to the reference 0); For the coefficients of the other explanatory variables see Table 4.1.

As regards the cross-country differences in the relative trust, the results broadly confirm those from the graphical analysis above. Belgium has been chosen as reference country, because many European institutions have their seats in Brussels. Some of the other EU-15 countries, namely Spain, France, Denmark, UK, Portugal, Austria, Finland, Cyprus and most notably Ireland, exhibit significantly higher relative trust in favor of the national parliament as a whole than Belgium. Almost all of the twelve new EU member states who joined the European Union in 2004 and 2007 show much higher relative trust in the European Parliament. This result has also been confirmed by the fifth regression in which the dummy variable for the EU-15 has a highly significant positive coefficient.

Trust in the national relative to the European government

Many of the results regarding relative trust in the parliament have been retained when trust in the national relative to the European government is used as a dependent variable instead. Table 4.3 reports the results corresponding to the variable *rel_trust_gov*, whereby the procedure of all six regressions corresponds to that in

the preceding subsection.

The coefficient of the variable approximating the effect of the relative political performance of the institutions remains positive and highly significant in all specifications. However, unlike the case of the parliament, the variable *rel_perf_econom* now shows a significantly positive coefficient in all six regressions.[20] This result confirms the hypothesis that not only the political performance but also the economic situation in the national country relative to that in the European Union has strong impact on relative trust in the government at national and EU level. Respondents who judge the current situation of the national economy to be better than that of the European economy are likely to place more trust in the national government than its European counterpart. This effect appears besides the impact of the benefits of the home country from being a member of the EU, since the variable *country_benefit* maintains its significantly negative coefficient in all specifications.

Contrary to the results regarding relative trust in the parliament, the variables capturing the understanding and knowledge of the respondents with respect to EU issues have significantly negative effect on the relative trust in the government in all six specifications.[21] Respondents who confess not to understand the way the European Union works as well as those who show less knowledge about the EU are likely to trust the national more than the European government. This result confirms the effect of the principal-agent problem on relative trust and implies that higher relative trust in the European government could be achieved by improving the transparency and information policy of the European institutions.

Further notable results regard the variables *voice* and *image*. In the case of relative trust in the government the coefficient of the variable *voice* turned out to be mostly insignificant. The variable capturing distortions of the image of the EU in the media has significantly positive effect in all regressions implying that the relative trust in favor of the national government is significantly higher among respondents who perceive the image of the EU as distorted in the media.

[20] In the regressions of relative trust in parliament the coefficients is significantly positive only in three out of six specifications.

[21] In two specifications the coefficient of the variable *understand* is significant only for the second reference value.

TABLE 4.3: Political trust in the national relative to the European government

	rel_trust_gov (1)	rel_trust_gov (2)	rel_trust_gov (3)	rel_trust_gov (4)	rel_trust_gov (5)	rel_trust_gov (6)
rel_perf_politic	.457 (.000)***	.530 (.000)***	.521 (.000)***	.529 (.000)***	.484 (.000)***	.548 (.000)***
rel_perf_econom	.264 (.001)***	.165 (.044)**	.162 (.045)**	.173 (.053)*	.178 (.018)**	.239 (.003)***
		.389 (.003)***	.387 (.003)***	.399 (.002)***	.401 (.001)***	
country_benefit	-.391 (.009)***	-.302 (.008)***	-.295 (.010)***	-.295 (.008)***	-.284 (.016)**	
	-.079 (.547)					
pol_discuss	-.072 (.217)	-.082 (.206)	-.085 (.165)	-.083 (.199)	-.079 (.218)	-.057 (.432)
	.222 (.165)	.278 (.078)*	.275 (.073)*	.275 (.080)*	.250 (.103)	.277 (.068)*
understand	-.123 (.103)	-.133 (.116)	-.140 (.079)*	-.135 (.100)*	-.185 (.013)**	-.219 (.003)***
	-.351 (.000)***	-.322 (.000)***	-.330 (.000)***	-.324 (.000)***		
knowledge	-.080 (.006)***	-.083 (.008)***	-.079 (.007)***	-.084 (.015)**	-.074 (.024)**	-.098 (.005)***
voice	-.017 (.676)	-.017 (.664)	-.017 (.669)	-.018 (.640)	-.015 (.712)	-.065 (.069)*
image	.066 (.214)	.094 (.024)**	.093 (.028)**	.093 (.026)**	.066 (.163)	.111 (.017)**
	.166 (.000)***				.153 (.000)***	
age	.001 (.784)	.001 (.756)	.001 (.773)	.001 (.766)	.001 (.807)	.001 (.646)
sex	.143 (.013)**	.140 (.015)**	.136 (.014)**	.140 (.015)**	.130 (.020)**	.157 (.022)**
education	.001 (.917)	-.004 (.497)	-.004 (.496)	-.004 (.522)	-.002 (.699)	-.004 (.551)
distance		-.000 (.319)				
language			.142 (.316)			
membership				.002 (.564)		
d_eu15					.388 (.004)***	
receipt						-.000 (.190)
cons	1.460 (.000)***	1.425 (.000)***	1.280 (.000)***	1.266 (.000)***	1.036 (.000)***	1.224 (.000)***
	-2.209 (.000)***	-2.213 (.000)***	-2.357 (.000)***	-2.366 (.000)***	-2.756 (.000)***	-2.515 (.000)***
Adj. R-squared	.0899	.0883	.0908	.0887	.0920	.0791
No	8472	7339	7339	7339	7339	6725

p values in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%; the parallel line assumption (i.e. equal slope coefficients above all categories of the dependent variable has been violated where two values are reported - the first value refers to the reference -1, the second to the reference 0); R^2 value refers to an OLS estimation; rel_trust_gov (1) with country-specific intercepts, see Table 4.4.

TABLE 4.4: Country-specific intercepts in the regression rel_trust_gov (1)

ger	-.046 (.385)	gre	-.433 (.000)***	spa	.251 (.002)*** -.268 (.000) ***
fra	.216 (.000)*** -1.054 (.000)***	ita	-.482 (.000)*** -.634 (.000)***	ire	.700 (.000)*** .112 (.055)*
lux	-.002 (.962) -1.101 (.000)***	den	.081 (.321) -.097 (.308)	net	-.088 (.049)**
uk	-.494 (.000)*** -.023 (.373)	por	.906 (.000)*** .450 (.000)***	aus	.895 (.000)*** .304 (.000)***
swe	-.092 (.121) -1.689 (.000)***	fin	-.502 (.000)*** -.159 (.002)***	cyp	.210 (.000)*** -.395 (.000)***
cze	-.840 (.000)*** -.122 (.011)**	est	.050 (.521) .430 (.000)***	hun	-.392 (.000)***
lat	.495 (.000)*** .318 (.000)***	lit	.203 (.012)** -.319 (.000)***	mal	-.392 (.000)*** -.701 (.000)***
pol	-.649 (.000)***	slovak	-.482 (.000)*** -37.96 (.)	sloven	-.439 (.000)***
bul	-.651 (.000)*** -1.293 (.000)***	rom	-.284 (.000)*** -.972 (.000)***		

p values in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%; the parallel line assumption (i.e. equal slope coefficients above all categories of the dependent variable has been violated where two values are reported - the first value refers to the reference -1, the second to the reference 0); For the coefficients of the other explanatory variables see Table 4.3.

For the control variables and the country specific variables, the results are similar to those with respect to the parliament. The only difference is the fact that the level of education has no significant effect here, but rather the sex of the respondents. Men tend to trust more the national than the European government as a whole, one possible explanation being a higher level of nationalism and conservatism among men. Furthermore, the coefficient of the variable distance is not significant with regard to the relative trust in the government. The coefficients of the country dummies are by and large similar to those in the regressions of the relative trust in the parliament with a few exceptions. The tendency that respondents from the twelve new EU member states show less confidence in the national relative to the European institution remains also in the case of the government, although to a smaller extent.

4.3.3 Summary of main findings

To sum up, the analysis in the present section has identified several explanations for the differences in the level of political trust in national relative to European institutions as represented by the parliament and the government. From the socio-cultural explanations for the differences in trust, gender and education turned out to have a significant impact on the relative trust, whereas male respondents and respondents with a higher level of education show less trust in European compared to national institutions. Furthermore, a better performance in political and economic terms of the European Union, the feeling of receiving benefits from the membership of the home country in the EU, as well as the perception that the image of the EU is correctly represented by the media are all factors which positively influence the level of trust in the European relative to the national institutions.

Behind the performance-based explanations, the empirical analysis indicates a considerable importance of the principal-agent problem in the way the European Union works on the relative trust. Lack of understanding and knowledge about the political process and the feeling that the interests of one's country are neglected at EU level are important factors which explain the fact that many EU citizens tend to trust the national rather than the European institutions. While socio-cultural factors can only partly be influenced by the politics of the institution, a better information strategy, more transparency and shorter chains of delegation should, at least to a certain extent, be helpful in solving the problem of the current democratic deficit in the way the European institutions fulfil their tasks.

4.4 Trust in times of crisis

In the present section the focus turns to the effect of the current economic crisis on the determinants of trust in European and national institutions. It is closely related to a series of publications by Roth et al., in which the authors analyze the development and determinants of net trust in different European and national political institutions[22] during the recent years (Roth 2009, Roth and Gros 2010, Roth et al. 2011, Roth et al. 2012). Roth and his co-authors observe declining trust in the European Central Bank, European Parliament and European Commission as a result of the financial crisis. On the contrary, the net trust in national institutions, such as the national governments and parliaments, increased immediately in the direct aftermath of 16 September 2008 in most EU countries. As Roth (2009) points out, the increasing trust in times of crisis has already been investigated by Chanley (2002), and is referred to as the "rally around the flag" effect described by Hetherington and Nelson (2003). According to Roth et al. (2011) the main explanations for the development of the net trust can be found in the perception of the citizens about the performance of the institution under consideration. They conclude that inflation is one of the parameters which influence the level of net trust when the economy runs smoothly, whereas in times of crisis its effect diminishes because European citizens tend to worry much more about jobs and the effects of recession. As pointed out in the previous discussion, Eurobarometer data in Roth et al. (2011) shows that increasing distrust in national institutions is related to an increase in unemployment in the EU-15. Besides unemployment, low growth of GDP per capita is associated with declining trust in the European Commission and the European Parliament in times of crisis. Furthermore, in the EU-27 increasing levels of public debt contribute to the decrease of net trust, both, in national and European governmental institutions.

As pointed out earlier, Roth and his co-authors analyze only the effect of economic development on political trust and do not include variables capturing the aspects of the principal-agent problem described above. The present section examines the effect of both performance-based and political-economic explanations on the level of trust in national and European political institutions in a panel analysis between 2004 and 2011. The empirical analysis investigates the determinants of trust in the national parliament and the national government on the one hand, and trust

[22] Net trust is calculated as the difference between the share of respondents who trust and the share of respondents who do not trust the particular institution. See below.

in their European counterparts, the European Parliament, the European Commission and the Council of the European Union on the other hand.

4.4.1 Empirical analysis

4.4.1.1 The data

Data about the dependent variables (trust in the national parliament, the national government, the European Parliament, the European Commission and the Council of the European Union) is taken from the Eurobarometer survey for the years 2004 to 2011.[23] 2004 is chosen as the beginning of the period under consideration because of the expected structural break in some data due to the Eastern Enlargement of the European Union. The analysis is based on semiannual data for 27 EU member states.[24] In order to account for the variation of the "don't know" responses, the dependent variables are represented as net trust calculated as the difference between the percentage of responses "Tend to trust" and that of "Tend not to trust".[25] The development of net trust in the governmental institutions and the European Union as a whole over time (not included in the empirical analysis) is shown in Figure 4.9. As indicated above, the net trust has been decreasing since the beginning of the economic crisis and has reached historically low levels at the end of 2011. However, the decline of net trust in national institutions was not that pronounced as net trust in European institutions, especially in recent years. In the extreme case of trust in the EU and trust in the European Parliament net trust declined by 35 points within seven years. Trust in national government and national parliament decreased by 20 and 22 points, respectively, during the same time period. Detailed data about the development of net trust in the 27 EU member states is provided in the composite Figure A1 in the Appendix.

[23]Data on trust in the Council of the European Union is however missing for the first half of 2009. Therefore, this observation has been excluded in the regressions of trust in the Council. Moreover, the formulation of the Eurobarometer question regarding trust in European institutions and its position within the questionnaire were changed in 2008. However, this should not have major influence on the quality of the analysis, since the content of the question was preserved.

[24]Croatia is not considered in the analysis.

[25]This procedure has been applied also for the case of all explanatory variables based on Eurobarometer data listed below.

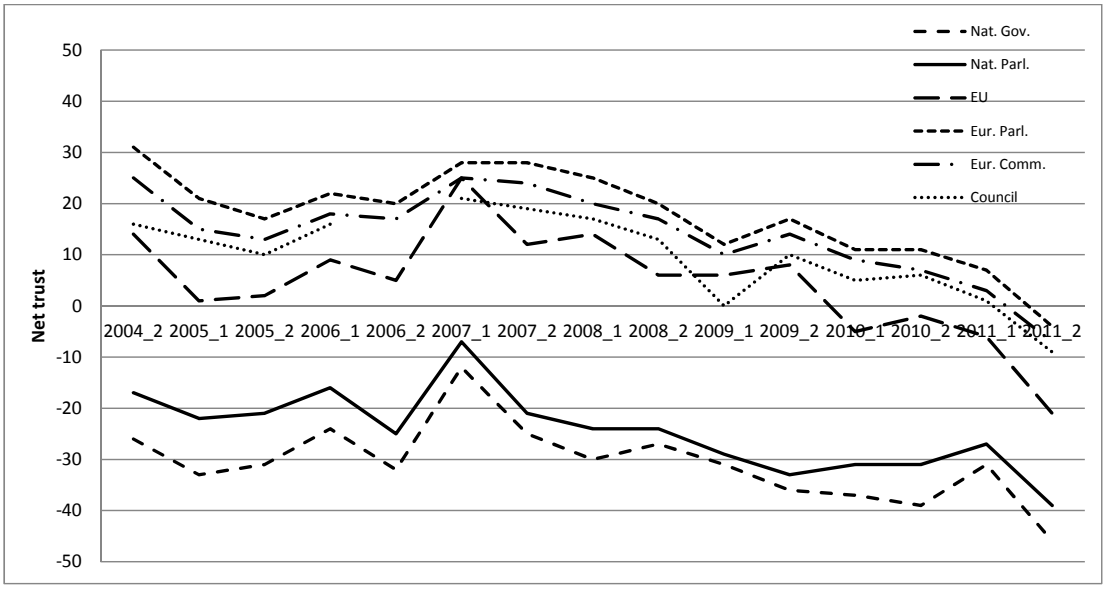


FIGURE 4.9: Net trust in national and European governmental institutions and the European Union in the EU27 (Source: Own calculations based on Eurobarometer data)

Four variables are used to investigate the importance of objective economic performance. The first variable, *gdp_growth*, contains data on growth of real GDP per capita for each country. The expected sign is positive, since an increase of GDP growth indicates a better performance of the national economy. If the population of the concrete country is satisfied with the performance of the governmental institutions measured in terms of GDP growth, then the overall net trust in the political institutions will increase. This should be the case for both national and European institutions depending on the level of governance which is held responsible for the economic conditions. However, it is still possible to obtain the opposite sign for European institutions if better economic performance of the national economy hampers the support for transferring competencies to the European level of government and vice versa (see above). The second variable, *unemployment*, contains data on unemployment rates in the EU member states. The expected sign of this variable is negative with regard to the national institutions, and could be positive or negative with regard to their European counterparts. The explanation is as in the case of GDP growth. The only difference is the fact that high unemployment rates do not indicate higher but rather lower performance of the political institutions, hence the opposed sign is expected. The third variable, *inflation*, captures the effect of inflation as further measure for the economic performance. In accordance with the argumentation above, the expected sign is the same as in the case of the unemployment rate. If, however, low inflation is evaluated as rather negative, which would be the case if the fear from deflation and wage reduction

prevails, then the sign of the coefficient could be as in the case of GDP growth. The fourth variable, *debt*, contains data on the development of government debt as a percentage of GDP. The expected sign is the same as in the case of unemployment, since increasing government debt is one of the main concerns during the current economic crisis.

Semiannual data for all four variables is taken or calculated from data provided by Eurostat. The unemployment rate in the first quarter of each year is used for the spring wave of the Eurobarometer survey, whereas the values in the third quarter are used for the autumn waves. For growth of GDP data is used for the six months preceding the respective survey. The semiannual inflation rates were obtained from the Harmonized Index of Consumer Prices (HICP), and measure the inflation between the months September of the preceding year and March of the current year for spring wave and between March and September of the current year for the autumn wave. Annual data on government debt is used for the variable *debt* and the values change only every second period.

Two variables calculated from Eurobarometer survey data are used to proxy the effect of perceived performance of the institutions on net trust. The best measure of the perceived performance would be according to the question about the respondent's judgment of the national and the European economy and democracy (as in the analysis of relative trust in the previous subsection). However, since these questions were not asked very often, many data are missing and two proxy variables were used. The first variable, *lifesatisfaction*, contains data on the responses to a question about the overall satisfaction of the EU citizens with the life they lead. Although life satisfaction reflects a broad range of different developments, it is expected to be positively correlated on average with the way democracy works, and with the economic conditions in a particular country. To the extent to which these aspects are influenced by the political institutions this variable should serve as a proxy for the perception of EU citizens of the performance of the institutions under consideration. In addition, the variable *expecteconomy* should capture the effect of expected economic development in their home country during the next twelve months as perceived by the respondents. If the respondents ascribe the extent to which they are satisfied with their life, and/or the expected development of the economic situation in the national economy to the performance of a political institution, the expected sign of the variable(s) in the regression of net trust should

be positive. It is still possible, however, to observe the opposite sign, if the positive evaluation of one institution leads to mistrust with regard to other institutions.

As in the case of relative trust, the effect of the net payer position of the EU member states on net trust is investigated using data from the series of Financial Reports of the European Commission (European Commission 2011). The net payments are calculated as the difference between the total revenue and the total expenditure in every country, and are expressed as percentage of GDP. Including the variable *net_contr* makes the extension of the time span to the year 2011 impossible, since the Financial Report for 2011 was not published at the time of the present research. The expected sign of the variable is negative in the regressions of net trust in European institutions, since positive net payment position indicates less benefits from the membership of the particular country in the EU, and therefore, in accordance with the principal-agent problem, less trust in the governmental institutions. As regards the national institutions, a positive or a negative sign is possible. On the one hand the national institutions may be held responsible for the amount of net payments to the EU budget, implying a negative sign of the coefficient. On the other hand, a positive sign is possible, since higher net payments indicate smaller benefits from EU membership and make the people rather trust the national institutions.

The role of the principal-agent problem for the process of trust-building and trust-maintenance is further approximated by three variables calculated from Eurobarometer data. In the present analysis the variable *knowledge* contains the country averages of the responses to the question "Have you heard of . . . ?" with respect to the particular European institution.[26] According to the theory behind the principal-agent problem, net trust in European institutions should increase as the (net) number of citizens, who are aware of the existence of the concrete institution, becomes larger. The variable in the regressions of trust in national parliament and national government is the average of the values for the three European institutions considered in the analysis. Similarily to the analysis of relative trust, the second variable, *understand*, contains information about the understanding of the population about the way the European Union works. Increasing net levels of understanding are expected to raise trust in European institutions. The third variable, *voice*, reflects the extent to which EU citizens agree with the statement

[26] The questions used in the individual data analysis in the previous section could not be used here due to missing data for several years.

"My voice counts in the European Union.".[27] Increasing values of this variable mean that more people believe in their ability to influence the political process within the structures of the European Union. Therefore, the expected sign of the variable is positive with regard to European institutions. Both, a positive and a negative sign of the coefficients can be justified regarding national institutions for all three variables. It is possible that lacking control mechanisms, knowledge and understanding concerning European institutions favors trust in national institutions if they are considered as alternatives to the European ones. However, it is more likely for the trust in national institutions to decrease as the share of the well informed population declines and/or as less people tend to believe that their voice counts in the EU, since the national institutions could be held responsible, both for the lack of information about European politics and for the poor democratic control of the European institutions. Moreover, it is very likely for the level of information about European institutions and the values of the variable *voice* to be positively correlated with overall political awareness and thus with the level of information about national politics on the one hand, and with the control possibilities with regard to national institutions on the other hand. Since this effect cannot be estimated directly due to the lack of suitable data, it cannot be ruled out that these effects are captured by the variables described above.

The dummy variable *elections* should control for temporary effects of elections on the level of net trust. Considering again Figure A1 in the Appendix this effect is visible in most of the EU member states. The election dates are represented by the gray vertical lines in the figure. If the fieldwork of the survey takes place at the time of elections or immediately after the new government was built, the net trust in national institutions tends to increase. The effect is very pronounced in Bulgaria, Estonia, Greece, Finland, Hungary, Ireland, the Netherlands, and Sweden. However, in most of the other countries the effect is present as well. In some countries a similar though less pronounced effect is observable with regard to the European institutions. In addition, the variable *EPelections* should capture the effect of European elections on net trust. The latest elections took place during the fieldwork of the spring survey of 2009. Although the influence of European elections seems not to be as pronounced as in the case of national elections the effect is visible in some countries, especially with regard to the net trust in European institutions (see e.g. Finland, Ireland, Italy, the Netherlands, and Spain). However, this variable will capture not only the effect of European elections on net

[27] Again, this variable differs from the variable *voice* used in the previous section due to missing data.

trust, but also other events affecting the EU member states in 2004[28] and 2009, since it takes the value one for all cross section units in this time period.

As further control variable *gdp_pc* contains Eurostat data on per capita GDP. It should control for changes in trust level, which occur as a reflection of the stage of economic development in the EU member states. The effect of the economic crisis is investigated using the dummy variable *crisis*, which takes the value one in the period since the second half of 2008.[29] The expected sign of this variable is negative both in the regression of trust in national and European institutions. In addition, the estimation has been run for both time periods, before and after 2008, separately. In the last specification, interaction terms between the variable *crisis* and the main determinants of political trust which are identified in the previous specification are used to test if the economic crisis has changed the magnitude and/or the sign of the concrete coefficients.

Table 4.5 summarizes the expected signs for the coefficients of the explanatory variables.

4.4.1.2 The method of the empirical analysis

In the following the estimation approach is presented before proceeding with the results of the empirical analysis.[30] The empirical model can be described by the subsequent equations:

$$y_{it} = \alpha + x'_{it}\beta + \upsilon_i + \epsilon_{it}, \tag{4.4}$$

whereas υ_i represents the unit-specific time-invariant residual accounting for cross-section heterogeneity and ϵ_{it} is the conventional residual with the usual properties. x'_{it} contains the it^{th} observation on the explanatory variables and β is vector with the coefficients of interest. The fixed-effects model deals with the correlation between υ_i and the variables in x_{it} by using the OLS estimators of the following

[28] In Bulgaria and Romania 2007.

[29] The turbulences in direct aftermath of September 15th 2008, the collapse of Lehman Brothers, are taken as the beginning of the severe economic crisis in Europe.

[30] See also Chapter 3.

TABLE 4.5: Expected signs for the coefficients of the explanatory variables

	Trust in national institutions	Trust in European institutions
gdp_growth	+	+/-
unemployment	-	-/+
inflation	-/+	-/+
debt	-	-/+
lifesatisfaction	+	+/-
expecteconomy	+	+/-
net_contr	-/+	-
knowledge	+/-	+
understand	+/-	+
voice	+/-	+
elections	+	+
EPelections	+	+
gdp_pc	+/-	+/-
crisis	-	-

+/- Positive sign is more likely to occur;
-/+ Negative sign is more likely to occur.

transformation of equation (1):

$$y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i)'\beta + (\epsilon_{it} - \bar{\epsilon}_i) \tag{4.5}$$

Therefore, the reported coefficients refer to the effect of a one unit increase in the particular explanatory variables on the dependent variable within the cross-section units. Alternatively, in a random-effects model the between and within estimators can be combined to produce more efficient results than the fixed-effects model. However, the results of the random effects model are inconsistent, if the unit-specific residuals υ_i are correlated with x_{it}. In such case, the coefficients estimated by the random-effects model are significantly different from those estimated by the fixed-effects model, and the random-effects model is misspecified. Although in some specifications of the present analysis the Hausman test cannot reject the null hypothesis of equal coefficients, it turned out that in most of the cases the random-effects estimators are biased. In order to assure comparability of the results the fixed-effects model is applied to all specifications, albeit more efficient

alternative would be available in some cases.

Besides the efficiency problem, there is one further point which should be stressed when using fixed-effects models: Since the model assumes time-invariant unit-specific residuals, it is not possible to estimate the effect of further time-invariant variables. In the context of the present analysis of trust in political institutions, for instance, it is not possible to use dummy variables for the EU-15 or for the GIPSI-countries[31] because these variables remain unchanged over the entire time period. Furthermore, it is not possible to investigate the effect of the spatial distance of the EU citizens from the institutions (the average distance does not change over time), or that of being net payer or net receiver of payments from the EU budget, since there has been only one change of the position - in 2007 Cyprus became net payer after being net receiver in the previous period. However, it is still possible to use the absolute amount of net payments (as percentage of GDP) for this purpose.

The reported standard errors are adjusted for possible heteroskedasticity and for cluster-specific effects alongside the cross-section units. Time dummies (d_t) are used to account for variation in the dependent variable, which is caused by common time varying effects not captured by the explanatory variables in the regression. Therefore, the end model to be estimated is given by the following equation:

$$y_{it} = \alpha + x'_{it}\beta + d'_t\gamma + \upsilon_i + \epsilon_{it}. \tag{4.6}$$

4.4.1.3 Results

The results of the empirical analysis are presented in Tables 4.6.A and 4.6.B. Six different specifications were applied. In the first specification only economic factors were included as in most of the previous studies of trust in national and European institutions. The second specification contains three variables capturing the effect of the principal-agent problem. In the third regression the model is extended by time dummies to account for time-fixed effects not captured by the remaining variables. The fourth and fifth specification are similar to the third one, the only difference being the time span of the data: The fourth specification contains solely the pre-crisis period, whereas the fifth specification investigates trust during the economic crisis. The last specification uses the whole data set and accounts for

[31] Greece, Ireland, Portugal, Spain and Italy: The EU countries, where the economic crisis is the most severe.

the structural break due to the economic crisis using interaction terms. In Tables 4.6.A and 4.6.B only coefficients significantly different from zero are reported.

The results of the empirical analysis show that trust in European institutions has been decreasing in recent years (Table 4.6.A). The coefficient of the dummy variable for the time period since the breakout of the economic crisis in 2008 used in the first two specifications is not significantly different from zero. Nevertheless, the time dummies in the third specification indicate that net trust was higher in the time period before 2008 and was significantly lower in 2009 and 2010 than in the second half of 2008, which served as a reference. Trust in the European institutions was particularly high in the second half of 2007, probably due to the economic turbulences overseas, and the positive evaluation of the performance of European institutions compared to the USA. Furthermore, as suggested by the descriptive analysis, net trust increases in times of elections. National elections have a strongly positive effect on trust, which remains relatively stable and can be observed in most of the institutions after accounting for time-fixed effects. Net trust in national institutions is by about five to eight points higher, if the field work of the survey takes place during the period of national election or a few months after the new government was built. Although to a lesser extent, trust in European institutions increases in times of national elections as well. A possible explanation is that citizens become more involved in political matters due to the intensified representation and discussion of political topics in the media and in the society in general. This result already points toward the effect of the principal-agent problem in the way political institutions fulfill their work: Providing more information about political institutions and incumbents, being present in society, and increasing political involvement of the general public is one way for the political actors to positively influence the process of trust-building among the citizens, and thus strengthen the legitimacy of governmental institutions. Especially the coefficient of the variable capturing the effect of European elections indicates the presence of the principle-agent problem. The coefficient is positive and significant in the first model but becomes smaller and insignificant in the case of net trust in the national parliament, when variables capturing different aspects of the principal-agent problem are also included (Model 2). Therefore it is not only the election itself which positively affects the net trust in political institutions, but also the flow of information and the belief of being involved in political matters and to influence the political decision making process during election times.

TABLE 4.6.A: Trust in national and European institutions: Empirical analysis

	European Commission			Council of the European Union			European Parliament			National Parliament			National Government		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
lifesatisfaction										1.400***	1.132***	1.045***	1.476***	1.221***	1.087***
										(.108)	(.152)	(.161)	(.138)	(.216)	(.216)
election	3.704***	3.288***	2.793***	2.977**	2.636**	2.008**	4.493***	4.215***	3.593***	6.330**	5.177*		8.220***	6.941**	5.527*
	(1.099)	(1.003)	(.948)	(.154)	(1.089)	(.960)	(1.300)	(1.325)	(1.269)	(2.543)	(2.700)		(2.930)	(3.090)	(3.095)
Epelections	4.622***	2.481*					5.957***	4.258***		4.204**					
	(1.340)	(1.367)					(1.419)	(1.544)		(1.907)					
gdp_pc															
net_contr	-2.507**	-2.152*	-2.372**	-2.491**		-2.713**	-2.612**	-2.306*	-2.447**						
	(1.010)	(1.074)	(.954)	(1.064)		(.991)	(1.022)	(1.130)	(.984)						
expecteconomy												.169**	.162**	.148*	.248***
												(.0673)	(.0718)	(.0800)	(.0764)
crisis			-			-			-			-			-
gdp_growth	.885***	.820***					.989***	.925***		1.006**					
	(.370)	(.277)					(.283)	(.271)		(.373)					
inflation															
unemployment															
debt	-.567***	-.606***	-.515***	-.488***	-.536***	-.379***	-.554***	-.594***	-.491***	-.621***	-.697***	-.544***	-.558***	-.636***	-.433**
	(.133)	(.108)	(.122)	(.115)	(.103)	(.103)	(.122)	(.102)	(.108)	(.129)	(.100)	(.119)	(.167)	(.142)	(.195)
knowledge	-			-	.0983**	.106**	-			-			-		
					(.0421)	(.0436)									
understand	-	.135***	.119*	-			-	.115**		-			-		
		(.0464)	(.0614)					(.0533)							
voice	-	.183***	.258***	-	.194***	.272***	-	.154**	.246***	-	.324***	.329***	-	.341***	.362***
		(.0573)	(.0461)		(.0544)	(.0419)		(.0689)	(.0534)		(.0906)	(.106)		(.117)	(.125)
D04_2	-	-	6.606* (3.253)	-	-		-	-	8.376*** (2.876)	-	-		-	-	
D05_1	-	-	3.979** (1.852)	-	-		-	-	2.970* (1.656)	-	-	-12.656*** (3.516)	-	-	-15.437** (5.605)
D05_2	-	-		-	-		-	-		-	-		-	-	
D06_1	-	-		-	-		-	-		-	-	-11.660*** (3.568)	-	-	-13.739** (5.930)
D06_2	-	-	3.571* (1.818)	-	-		-	-		-	-	-15.988*** (3.179)	-	-	-17.899*** (5.775)
D07_1	-	-	3.745* (2.118)	-	-		-	-		-	-		-	-	
D07_2	-	-	7.008*** (2.045)	-	-		-	-	7.485*** (1.976)	-	-	-14.829*** (3.100)	-	-	-14.352** (6.091)
D08_1	-	-	3.560* (1.928)	-	-		-	-	4.247** (1.742)	-	-	-11.947*** (3.669)	-	-	-13.804* (6.818)
D08_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D09_1	-	-	-9.418** (3.974)	-	-	-	-	-	-7.850* (3.931)	-	-	-	-	-	-
D09_2	-	-	-	-	-		-	-		-	-	-1.725 (3.301)	-	-	-14.319** (6.391)
D10_1	-	-	-6.667** (2.528)	-	-	-1.665*** (1.838)	-	-	-7.700*** (2.578)	-	-	-13.501** (4.916)	-	-	-15.387** (6.851)
D10_2	-	-	-5.048** (2.427)	-	-	-8.200*** (1.728)	-	-	-5.345** (2.402)	-	-	-1.283* (5.182)	-	-	-14.410* (7.469)
R2 (within)	0.6902	0.5154	0.5941	0.3987	0.4672	0.5555	0.468	0.5143	0.6013	0.5636	0.6053	0.6702	0.4889	0.5245	0.5852
time	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010	2004-2010
N	324	324	324	297	297	297	324	324	324	324	297	297	324	297	297

(1) Regression for 2004-2010, no principal-agent variables; (2) Regression for 2004-2010, no time dummies; (3) Regression for 2004-2010 including time dummies; Only coefficients significantly different from zero are reported; */**/*** significant at the 10/5/1 per cent level.

Among the variables capturing the effect of the principal-agent problem the variable *voice* has the strongest impact on net trust. Respondents exhibit higher trust in governmental institutions if they believe their voice counts in the European Union. Interestingly, the effect of this variable is significant, not only in the case of European institutions; the coefficient is significant and even higher in the regressions of net trust in national institutions. This is the combination of both effects discussed in the previous section: On the one hand, citizens hold their national governments and parliaments responsible for the low weight of their voice within the structures of the European Union. On the other hand, this variable is expected to capture the effect of the possibility to influence the overall political process on trust in institutions, since the question in Eurobarometer was asked only with regard to the European Union and not with regard to concrete institutions. Net trust can, ceteris paribus, be increased by one to two per cent if three per cent of the respondents change their opinion, and begin to believe that their voice does indeed count in the European Union. The other two variables, *understand* and *knowledge* also exhibit significantly positive coefficients in some of the specifications. Increasing share of those respondents who assert to understand how the European Union works leads to higher net trust in the European Commission and the European Parliament. Trust in the Council of the European Union is furthermore positively connected to the knowledge of the population about the existence of this institution, although the magnitude of this relationship measured by the coefficient of the variable *knowledge* is relatively low.

A slightly different aspect of the responsibility of national governmental institutions for the position of a particular country within the European Union is indicated by the coefficient of the variable capturing the effect of the net payments to the EU budget. The coefficient is negative and mostly significant in the regressions regarding the European institutions. The net share of respondents who tend to trust the European governmental institutions decreases by about two to three per cent, if the net payment position of the member state under consideration increases by one percentage point relative to GDP. However, this is not the case in the regressions concerning the national institutions. Therefore, people trust the European institutions less, if they have to pay more for European matters. At the same time they do not blame the national institutions for they are the ones who have allowed for or accepted those circumstances.

Among the variables capturing the impact of the overall economic situation only the variable *debt* has a strongly significant effect in most of the specifications. People tend to trust both the European and the national institutions less, if the government debt of their respective country increases over time. However, the variables *inflation*, *gdp*, and *unemployment* mostly do not have a significant impact onthe net trust in the overall regression. Only GDP growth is partly significant in the first two specifications, but the effect diminishes after inclusion of time dummies.

Altogether, net trust in European and national institutions seems to have similar determinants in the overall regressions. Besides the variable *net_contr*, the other exception is the variable *lifesatisfaction*, which has significantly positive coefficient only with regard to national institutions. People evaluate national political institutions as more trustworthy, if they are satisfied with the life they lead. This result can be motivated by the fact that the performance of political institutions in terms of economic and social conditions is positively related to the overall life satisfaction of the population.

Trust in times of crisis

The second part of the analysis is devoted to the question about the determinants of net trust in times of crisis. In columns (4) and (5) of Table 4.6.B the regressions are estimated for the two sub-periods – before the crisis and during the crisis. The comparison of the results of both periods points at the presence of similarities as well as significant differences between the determinants of net trust before and during the economic crisis. Although the absolute value of the coefficient of the variable *debt* changes between the different specifications, the effect of public debt on net trust can be generally confirmed for both periods. Similar conclusion can be drawn with regard to the variable *voice*: The coefficient remains positive and significantly different from zero in the regressions concerning net trust in European institutions. However, the coefficient increases in times of crisis and becomes almost twice as large as the coefficient prior to 2008. Therefore, the negligible impact the EU citizens have on the political process tends to decrease trust in European institutions more heavily in times of crisis. Nevertheless, this is not the case when considering net trust in national institutions. Here, the coefficient of the variable *voice* is significantly positive for the time period before the crisis and becomes insignificant during the crisis indicating the existence of other reasons for declining trust in national institutions in times of crisis. The other variables

capturing the effect of the principle-agent problem exhibit significantly positive coefficients prior to the beginning of the economic crisis. In accordance with the theoretical considerations, net trust increases if the citizens of the EU member states understand how the EU operates or if they are familiar with the particular political institution. However, this effect becomes insignificant during the crisis.

Further differences in the determinants of net trust concern the coefficients of the variables *lifesatisfaction*, *elections*, *net_contr* and *expecteconomy*. The coefficient of the variable capturing the effect of the overall life satisfaction of the respondents is significant merely in the period prior to 2008. Surprisingly, the coefficient is negative with regard to the European institutions and positive with regard to their national counterparts. Therefore, increasing life satisfaction leads to higher trust in national governmental institutions and lower trust in the European Commission, the Council of the European Union and the European Parliament. The explanation for the different sign of the coefficient can be as follows. As a direct effect people could ascribe a gain in life satisfaction to the performance of the national institutions. This consideration could explain the positive sign of the coefficient in the regressions of the national parliament and the national government. The negative sign of the coefficient in the regressions of trust in EU institutions could be explained as an indirect effect of the performance of the national institutions. Decreasing life satisfaction could be due to poor performance of national institutions, and it could induce higher trust in the European institutions if they are considered an alternative to the national ones. Whatever the reason for the different sign, the coefficient for all five institutions becomes insignificant during the crisis.

The coefficient of the variable capturing the effect of national elections is significantly positive in the period before the economic crisis only in the regressions regarding the European institutions. After 2008 the stimulating effect on net trust decreases and becomes insignificant in the case of the European Commission and the European Parliament. A similar outcome can be observed also for the variable *expecteconomy*. Apart from the European Parliament and the Council of the European Union, people tend to trust more all institutions if they expect the economic situation in their country to get better in the next twelve months prior to the economic crisis. During the crisis this effect diminishes.

TABLE 4.6.B: Trust in national and European institutions: What changes due to the economic crisis?

	European Commission			Council of the European Union			European Parliament			National Parliament			National Government		
	(4)	(5)	(6)	(4)	(5)	(6)	(4)	(5)	(6)	(4)	(5)	(6)	(4)	(5)	(6)
lifesatisfaction	-.401***			-.395***			-.438***			1.093***		1.189***	1.199***		1.32***
	(.0756)			(.0816)			(.0657)			(.177)		(.173)	(.259)		(.246)
inter_lifesatisfaction	-	-	.157**	-	-	.205***	-	-	.177***	-	-		-	-	
			(.0724)			(.0515)			(.0576)						
elections	3.576***		3.236**	2.247*		2.627*	4.214**	2.921**	4.04**						
	(1.273)		(1.552)	(1.144)		(1.412)	(1.595)	(1.384)	(1.848)						
inter_elections	-	-		-	-		-	-		-	-		-	-	
EPelections	-	-	3.261**	-	-		-	-	4.86***	-12.09***	-		-14.323**	-	
			(1.361)						(1.644)	(2.852)			(6.225)		
gdp_pc		-.716*			-.792*					-1.369***			-1.323**		
		(.375)			(.399)					(.405)			(.604)		
net_contr			-3.069*			-2.87*									
			(1.591)			(1.584)									
inter_contr	-	-		-	-		-	-		-	-		-	-	
expecteconomy	.080*									.178***			.279***		.158*
	(.0419)									(.0645)			(.0864)		(.0842)
crisis	-	-		-	-		-	-		-	-		-	-	
gdp_growth												1.701**			1.383*
												(.647)			(.717)
inter_gdp	-	-	1.159**	-	-		-	-	1.304**	-	-	-1.986**	-	-	-2.715**
			(.560)						(.556)			(.861)			(1.265)
inflation															
inter_inflation	-	-		-	-		-	-		-	-		-	-	
unemployment											-.169**				
											(.0733)				
inter_unemployment	-	-	-.051*	-	-		-	-		-	-	-.151**	-	-	-.146*
			(.026)									(.0609)			(.0805)
debt	-.507***	-.658**	-.516***		-.440*	-.440***	-.326*	-.523*	-.508***	-.648***	-1.094***	-.733***		-1.397***	-.752***
	(.161)	(.251)	(.125)		(.235)	(.0953)	(.174)	(.270)	(.120)	(.195)	(.365)	(.135)		(.474)	(.169)
inter_debt	-	-		-	-	-.079*	-	-		-	-		-	-	
						(.0387)									
knowledge				.175***		.161***	.235**								
				(.0574)		(.0410)	(.0930)								
inter_knowledge	-	-		-	-		-	-		-	-		-	-	
understand	.212**	.251**	.192***	.154*		.129***	.193**		.177***	.229*					
	(.0961)	(.118)	(.048)	(.154)		(.0527)	(.0846)		(.0587)	(.127)					
inter_understand	-	-	-.214*	-	-	-.225**	-	-	-.235*	-	-		-	-	
			(.124)			(.0836)			(.119)						
voice	.164**	.254***	.118*	.200***	.380**	.120*	.165**	.237**		.312***		.312***	.404***		.383***
	(.0636)	(.0833)	(.061)	(.0573)	(.147)	(.0615)	(.0651)	(.0864)		(.0800)		(.0923)	(.110)		(.123)
inter_voice	-	-		-	-	.123*	-	-		-	-		-	-	
						(.123)									
D04_2		-	-		-	-	4.652* (2.355)	-	-	12.410*** (3.928)	-	-	12.026* (6.528)	-	-
D05_1		-	-	-4.040* (2.064)	-	-		-	-		-	-		-	-
D05_2		-	-	-3.651* (1.909)	-	-		-	-		-	-		-	-
D06_1	-3.673** (1.727)	-	-	-4.558** (1.752)	-	-	-4.772*** (1.702)	-	-		-	-		-	-
D06_2		-	-		-	-		-	-		-	-		-	-
D07_1		-	-		-	-		-	-	8.716** (3.419)	-	-		-	-
D07_2	4.361** (4.361)	-	-		-	-	4.781** (4.781)	-	-		-	-		-	-
D08_1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D08_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D09_1	-	-7.513*** (2.599)	-	-	-	-	-	-8.114** (3.545)	-	-	-	-	-	-	-
D09_2	-	-	-	-		-	-		-	-		-	-		-
D10_1	-	-5.792* (2.860)	-	-	-1.700*** (2.687)	-	-	-7.694** (-7.694)	-	-		-	-		-
D10_2	-		-	-	-6.551** (2.828)	-	-	-5.315* (3.019)	-	-		-	-		-
R2 (within)	0.4698	0.6711	0.5598	0.4114	0.7297	0.5463	0.479	0.6147	0.5541	0.6933	0.7057	0.6368	0.6318	0.5791	0.5538
time	2004-2008	2008-2010	2004-2010	2004-2008	2008-2010	2004-2010	2004-2008	2008-2010	2004-2010	2004-2008	2008-2010	2004-2010	2004-2008	2008-2010	2004-2010
N	216	108	324	216	81	297	216	108	324	216	81	297	216	81	297

(4) Regression for 2004-2008, including time dummies; (5) Regression for 2008-2010, including time dummies; (6) Regression for 2004-2010 with interaction terms, no time dummies; Only coefficients significantly different from zero are reported; */**/*** significant at the 10/5/1 per cent level.

In the last column of Table 4.6.B the shift of the coefficients discussed above is further investigated using a larger data set. Model (6) can be considered an extension of Model (2), whereas interaction terms should account for the difference of the coefficients before and during the crisis. The results of Model (6) mostly confirm the previous findings. Elections had temporary positive effect on net trust mostly before the crisis. Increasing public debt reduces trust, and the effect is stronger during the crisis, in particular, when concerning the Council of the European Union. Having the feeling that the own voice counts within the European Union increases trust, and again the effect is stronger during the crisis with regard to the Council of the European Union.

Although many of the conclusions drawn above can be confirmed here, there are further effects which can be detected using this richer data set. It is still the case that understanding the way the European Union works leads to higher trust levels prior to the economic crisis. However, the coefficient of the interaction term is negative with regard to the European institutions and larger than the coefficient for the pre-crisis period. Therefore, increasing knowledge and understanding of European politics makes the European institutions even less trustworthy in times of crisis. Furthermore, there are some variables capturing the overall economic conditions deserving special attention. GDP growth in particular has a significantly positive coefficient prior to the economic crisis in the regressions concerning the national institutions. The explanation might be similar to that regarding life satisfaction.[32] Increasing GDP growth can positively affect trust in national institutions if citizens ascribe the improvement of economic conditions to the performance of the particular institution. This effect is reversed in the second time period, since the coefficient of the interaction term is significantly negative and larger in absolute terms. According to the sign of the difference of the coefficients, in the crisis people exhibit higher trust levels with regard to the national institutions the lower is GDP growth. This outcome shows that national institutions become more trustworthy as crisis managers in times of severe economic crisis. The significantly positive coefficients of the interaction term in the regressions of trust in the European Commission and the European Parliament indicates that this is not the case for the European institutions. The interaction term of unemployment is also negative in the regressions of trust in the European Commission and trust in the national institutions. Increasing unemployment did not determine trust in the pre-crisis period but has gained in importance since the beginning of

[32] See above.

the economic crisis.

4.4.2 Summary of main findings

Although the results of the empirical analysis do not indicate directly that the population of the European Union is dissatisfied with the political regime as a whole, they show that increasing distrust in governmental institutions in recent times is driven not only by the prevailing unfavorable economic conditions, but also by constituent characteristics of the political system. People tend to trust both national and European institutions more if they are well informed about the political process, and furthermore if they believe their voice and opinions are not ignored by the incumbents of the institutions. Overall political alienation is driven by increasing public debt and unemployment in times of crisis. However, the empirical results show that the "rally around the flag" effect described by Hetherington and Nelson (2003) causes the citizens of the European Union to return to their national governments as the economic conditions deteriorate. While low levels of overall life satisfaction were partly responsible for the willingness of citizens to transfer competencies to the EU level of government in the time period before the crisis, this effect is no longer present in recent years. Moreover, decreasing economic growth during the crisis makes people trust the national and distrust the European institutions. The dissatisfaction of the EU citizens with the political regime is further reflected in the fact that better understanding of the way the European Union works is associated with lower trust levels since the breakout of the economic crisis.

4.5 Concluding remarks

The results of the empirical analyses presented in this chapter reveal that trust in national and European political institutions is not solely determined by socio-cultural and performance-based factors. Further explanations for the level of political trust result from the principal-agent problem due to the constituent characteristics of the political regime. The problem is more severe at European level since European authorities are more distant from the representative voter – both in direct and figurative sense. Long delegation chains and the lack of control mechanisms explain the fact that European citizens are not aware of political matters at the European level and do not have incentive to collect information. As a result, trust in European institutions declines rapidly both in absolute terms and compared to national institutions.

All these results indicate that the economic crisis should not be used as pretext to promote further centralization, as it is currently the case. The legitimacy of a broad range of common measures to combat the economic turbulences is by and large questionable. The discussion about alternative methods of political decision-making with regard to significant steps in the process of European integration (e.g. referenda in the style of Switzerland) should not be disregarded but rather appreciated and encouraged.

Figure A1. Net trust in national and European governmental institutions and the European Union: Country series (Source: Own calculations based on Eurobarometer data) (II)

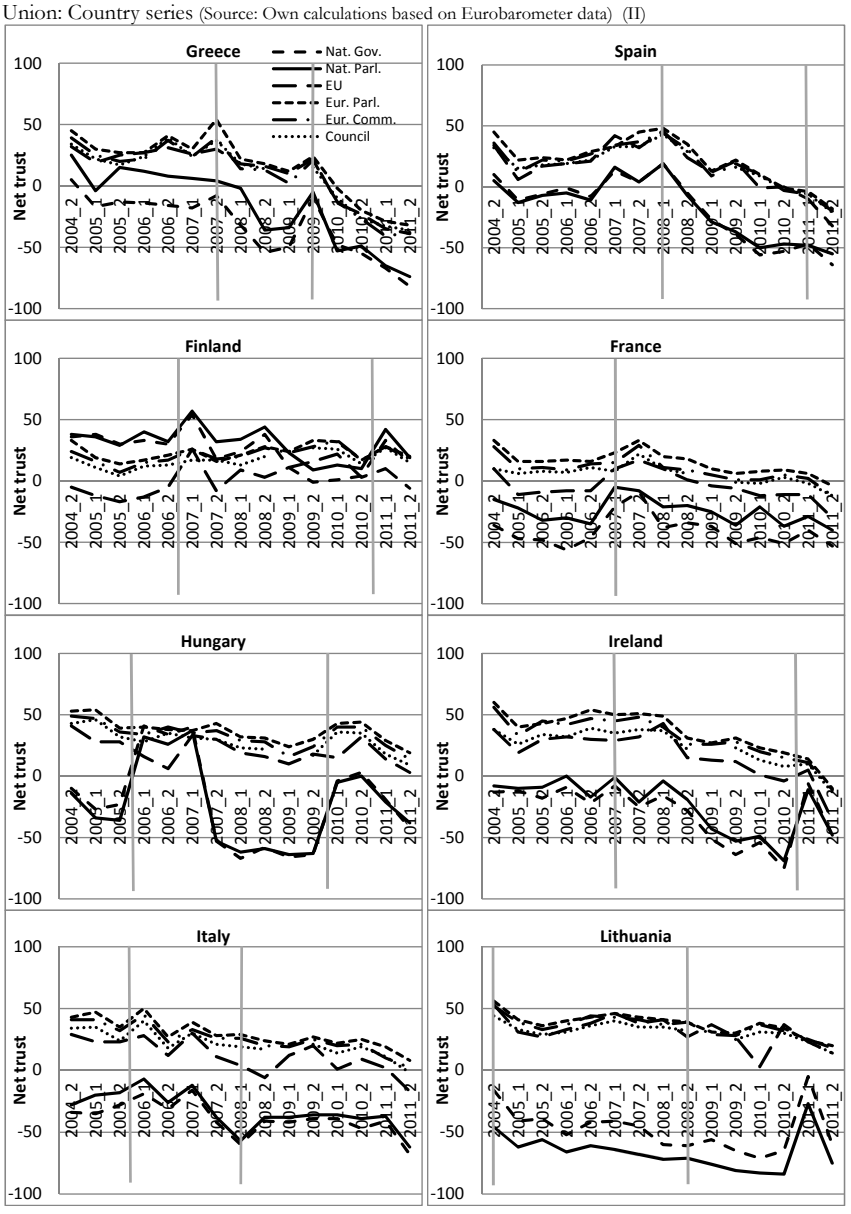


Figure A1. Net trust in national and European governmental institutions and the European Union: Country series (Source: Own calculations based on Eurobarometer data) (III)

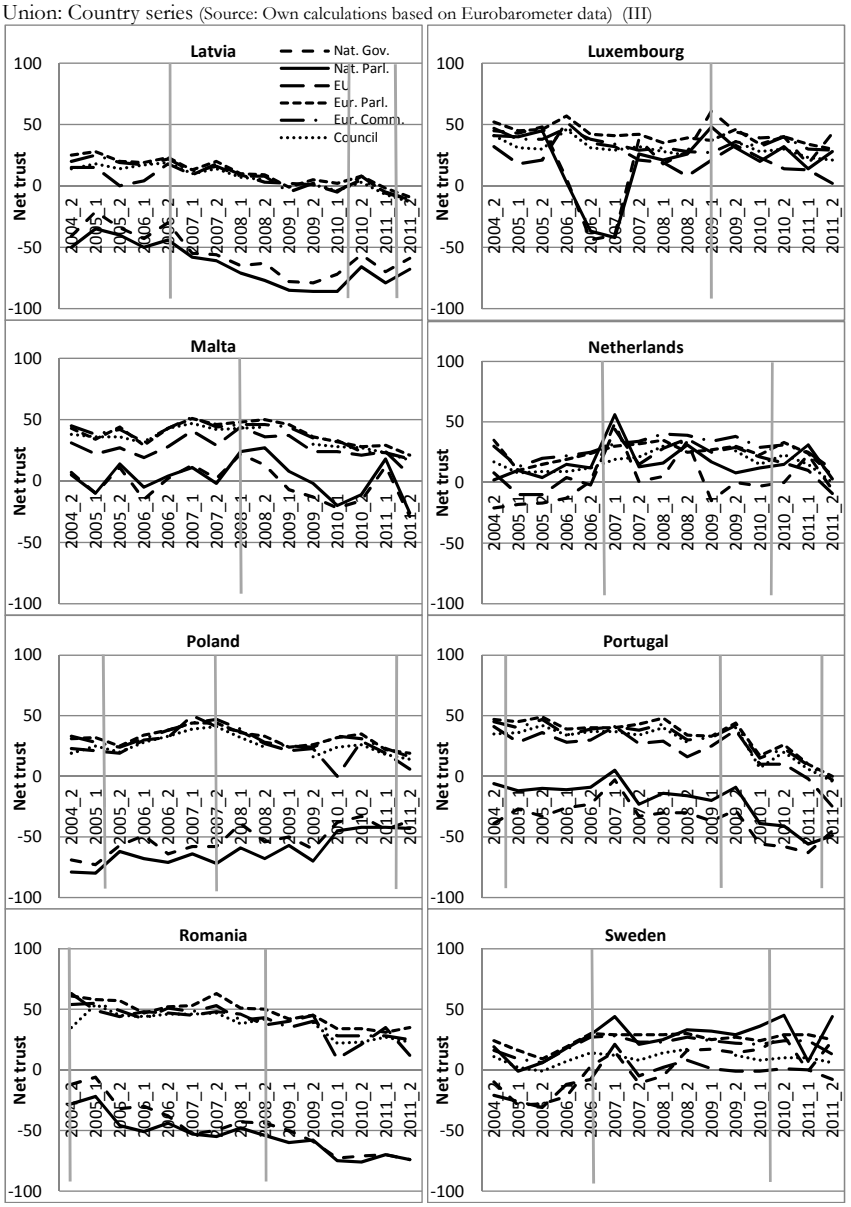
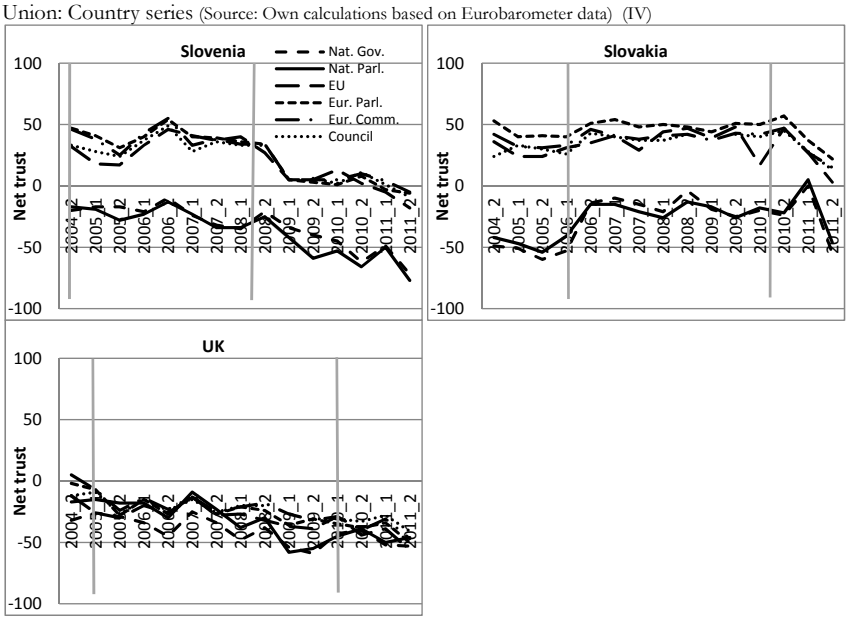


Figure A1. Net trust in national and European governmental institutions and the European Union: Country series (Source: Own calculations based on Eurobarometer data) (IV)



Chapter 5

Did the Bundesbank target monetary expansion or inflation? Evidence from monetary base growth[1]

5.1 Introduction

In the last years prior to the introduction of the Euro, several empirical studies raised doubts whether the Bundesbank had been pursuing monetary targets. First, von Hagen (1995) demonstrated that, in 1979–1993, the rate of monetary expansion had been uncorrelated with the announced target rate and that the deviations from target showed a significantly negative correlation with both the deviation of inflation from the underlying inflation objective and the rate of change of the real exchange rate.[2] Second, Bernanke and Mihov (1997) tested for Granger causality and found that the monthly variations of the German call rate were significantly affected by the expected inflation rate but not by the expected rate of monetary expansion (nor by the expected rate of change of industrial production and the nominal exchange rate). Moreover, the expected rate of inflation had a more significant effect on the Lombard rate than the expected rate of monetary

[1] Co-author: Roland Vaubel; published in Swiss Journal of Economics and Statistics 148(3):439-447, 2012.

[2] Neumann (1997) confirmed the second of these results. In his analysis, the deviation of monetary expansion from target also exhibited a significantly positive correlation with money demand shocks estimated as residuals from a velocity regression. By contrast, deviations of economic growth from potential did not have a significant effect.

expansion had. Third, Clarida and Gertler (1997) found that monthly variations in the German overnight rate among banks followed a Taylor rule, reacting significantly to the deviation of both (expected) inflation and industrial production from trend. Fourth, Clarida, Gali and Gertler (1998) added that this interest rate had also been significantly affected by the real exchange rate and the US federal funds rate but not by the deviation of monetary expansion from the preannounced target. Finally, Solveen (1998) confirmed that the short-term interest rate did not significantly respond to deviations of monetary expansion from target in a reaction function.[3]

At the time, the publication of these research results was of considerable political significance. Was the Bundesbank, one of the most successful inflation fighters of the world, not a monetary targeter after all? Did it pursue an inflation target instead? The issue is not whether the Bundesbank had an inflation objective. It had. It derived its monetary target from the inflation objective and assumptions about potential output growth and the velocity trend in a quantitytheoretic framework. The issue is whether it was committed to the announced money supply target or to the underlying inflation objective which it also published. Even though the money supply targets were derived from inflation objectives,they were considered superior to direct inflation targets because the money supply can be controlled much more closely than the inflation rate. Thus, the central bank's responsibility for missing the target is much clearer in the case of monetary targets. The incentive to pursue a money supply target is much stronger than the incentive to pursue an inflation target.

The above-mentioned econometric studies were bound to affect the monetary strategy of the future European Central Bank (ECB). The ECB did indeed adopt an inflation target band (from zero to two percent) but announced a "reference rate" for monetary expansion (M3) as a concession to the monetarists. However, it did not take this indicator very seriously and in May 2003 delegated it to second rank. Some argue that it has been abandoned. None of the other participating central banks had been announcing money supply targets. They had been pegging to the deutschemark.

[3]Subsequently, Kamps and Pierdzioch (2003) came to the same conclusion. For other recent estimates of Bundesbank reaction functions see Faust et al. (2001), Heinemann and Hüfner (2004), Clausen and Hayo (2005), Hayo and Hofmann (2006) and Hayo (2007).

In the meantime, these studies have been criticized on several grounds. The first critic was Helmut Schlesinger, the former president of the Bundesbank. He emphasized that "money supply changes within the announced band, especially within the first months of the year, did not require any reaction but merely attention. Most of the econometricians ignore this and treat the mid-point of the band as the target" (Schlesinger, 2002: 147, our translation). We shall remedy this defect in the analysis of this paper.

Second, Gerberding, Worms and Seitz (2004) have criticized that these studies ignore the lag in the availability of data. Using real-time data, they find that the short-term interest rate reacted significantly to (i) the deviation of the inflation rate from the underlying objective, (ii) expected output growth, (iii) the interest rate in the previous quarter and (iv) the deviation of monetary expansion from target. Clausen and Meier (2005), who also use real-time data, confirm this result in an error-correction model.

The third criticism which has been levelled against all these studies (except von Hagen, 1995) is that central bank policy is measured by some short-term interest rate. As Schlesinger (2002) has also stressed, a short-term interest rate, even if it is the central bank's main lending rate, fails to capture all its monetary policy actions. For example, changes in reserve requirements, changes in discount or Lombard credit lines and foreign exchange interventions are entirely ignored. The comprehensive measure of the central bank's policy actions is the monetary base adjusted for changes in reserve requirements. This aggregate is also likely to bear a closer relation to the money supply, the target variable, through the money multiplier[4] than a short term interest is likely to do. For these reasons, the following analysis uses the adjusted monetary base.

5.2 Hypotheses

The main hypothesis to be tested in this chapter is that changes in the Bundesbank's adjusted monetary base growth (db) reacted negatively to deviations of the

[4]Scheide (1993) has shown that the DM multiplier has been highly predictable - even after monetary unification.

money supply from its target.[5] Thus, we hypothesize that adjusted monetary base growth (b) is ceteris paribus constant (the change is zero) if the deviation of the money supply (M) from target (M^*) is zero.[6] Since 1979, the first year of our time series, the targets have usually been defined as bands of two or three percent. Thus, as has been explained, the deviations from target will be measured, first of all, as the deviations from the nearest margin of the target band ($M - M^*_{mar}$). However, we shall also compare this with an estimate using the deviation from the midpoint of the band ($M - M^*_{mid}$).

We include three control variables which are commonly used in the literature:

- the change in the growth of production,
- the change in the rate of unemployment,
- the change in the DM/USD exchange rate growth.

All explanatory variables are lagged.

Finally, we compare these two estimates of monetary targeting with two estimates of inflation targeting: (i) the lagged deviation of the inflation rate from the Bundesbank's inflation objective ($p_{t-1} - p^*_{t-1}$) and (ii) the currently expected deviation ($E_t(p_t) - p^*_t$) estimated from an ARMA (2,2) process.

5.3 Data

The time series of our dependent variable starts in the third quarter of 1979 and ends in the last quarter of 1998 so that we have 78 observations. We do not include the period from 1975 to 1978 because our adjusted monetary base series contains

[5] Until 1987, the target variable was "central bank money", thereafter the money supply M3. Central bank money in the definition of the Bundesbank was not the same as the monetary base but comprised the components of M3 weighted by constant values of their minimum reserve ratios.

[6] Note that Clarida et al. (1998) regress the level rather than the change of their policy instrument, the short-term interest rate, on the deviation from monetary target. Thus, they test the hypothesis that the interest rate is ceteris paribus zero if the deviation from target is zero.

a statistical break in June 1978 and because 1979 is generally considered the beginning of resolute monetary targeting by the Bundesbank. Our data is quarterly. The monetary base data has been seasonally adjusted using the additive Census-X12-ARIMA procedure.

The mid-points of the Bundesbank's money supply targets have been computed for each quarter by applying the target growth rate, announced in the fourth quarter of the preceding year, to the average money stock prevailing in the quarter in which the announcement was made. Then the limits of the target bands were calculated by applying the announced percentage margins to the target midpoints.

The inflation rate is measured by the Consumer Price Index and output by Gross Domestic Product. The data sources are listed in Table 6.2 in the Appendix.

5.4 Estimates

As all time series are stationary, we use ordinary least squares.[7] As for the lags, all conventional information criteria (AIC, HQIC and SBIC) indicate a maximum lag of one quarter for all control variables. To deal with any remaining autocorrelation and heteroskedasticity we use the Newey-West variance estimator allowing for possible autocorrelation up to four quarters.

Table 6.1 contains our results. Columns 1 to 4 include only the hypothesized target variables, one by one, plus two dummies for the statistical break at the time of German re-unification (1990Q3 and 1990Q4) which are highly significant and contribute considerably to the explanatory power of the regression. As can be seen the deviation of money supply from its nearest target margin reduces the change of adjusted monetary base growth. The effect is significant at the 5 percent level but not very large. If the deviation of money supply from the midpoint of the band is used instead, the coefficient decreases in absolute terms and is significant only at the 10 percent level. By contrast, the inflation deviations as alternative

[7] We use the Augmented Dickey-Fuller test and the Phillips-Perron test. All time series are stationary according to both tests except for the expected deviation of inflation from target. However, this variable turns out to be stationary when using the modified Dickey-Fuller test proposed by Elliott, Rothenberg, and Stock (1996).

TABLE 5.1: Changes of adjusted monetary base growth, 1979Q3-1998Q4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intercept	.01	.02	-.04	-.04	-.06	-.05	-.09	-.09
	(.15)	(.21)	(.55)	(.53)	(.61)	(.55)	(1.11)	(1.10)
deviation of money supply from nearest target margin in percent $(t-1)$	-.17**				-.15*			
	(2.04)				(1.74)			
deviation of money supply from target midpoint in percent $(t-1)$		-.10*				-.08		
		(1.85)				(1.42)		
deviation of inflation from objective $(t-1)$			-0.00				-.08	
			(.01)				(1.12)	
expected deviation of inflation from objective (t)				-.02				-.08
				(.23)				(.98)
change of real GDP growth $(t-1)$					-.05	-.05	-.07	-.06
					(.82)	(.82)	(1.16)	(.95)
change of unemployment $(t-1)$					.82*	.80*	.97**	.92**
					(1.95)	(1.91)	(2.42)	(2.32)
change of DM/USD exchange rate growth $(t-1)$					-.04	-.04	-.04	-.04
					(1.13)	(1.15)	(1.18)	(1.13)
dummies for 1990Q3 and Q4	yes	yes	yes	yes	yes	yes	yes	yes
adj. R^2	.60	.60	.59	.59	.61	.62	.61	.61

***/**/*: significant at 1/5/10 percent level;
t-statistics in parentheses (computed from Newey-West standard errors.)

potential target variables (columns 3 and 4) do not have a significant effect.

In columns 5 to 8 we add the change of real GDP growth, the change of the unemployment rate and the change of the DM/USD exchange rate growth to each of the regressions 1 to 4. The coefficient of the deviation of money supply from the nearest target margin decreases and its significance drops to the 10 percent level (column 5); the coefficient of the deviation from the midpoint of the band now loses its significance completely (column 6). The coefficients of the control variables are also insignificant at conventional levels – but only marginally for the change in the unemployment rate. The inflation target variables remain completely insignificant (columns 7–8).

To analyze the statistical break further, we split the time series in 1990. The number of observations drops to 44 in the first subperiod (1979Q3 to 1990Q2) and 32 in the second (1991Q1 to 1998Q4). The Chow test shows that there is no significant structural break in regressions 1 and 2.

5.5 Conclusion

Our analysis demonstrates that the changes of monetary base growth adjusted for changes in minimum reserve requirements, the summary measure of the Bundesbank's policy actions, responded negatively and significantly to deviations of money supply growth from the announced target if the deviation is correctly measured, namely, from the nearest margin of the announced target band. By contrast, if the deviation is measured from the mid-point of the target band, the coefficient decreases and its significance drops to the 10 percent level. Deviations of current or expected inflation from the underlying inflation objective do not have a significant effect, regardless of whether control variables are added. The hypothesis that the Bundesbank has been an inflation targeter has to be rejected. Our results favor the hypothesis that the Bundesbank has targeted the money supply even though its effect on monetary base growth is fairly small and not robust to the addition of standard control variables.

Appendix

Table 5.2: Data: Definitions and sources

Series	Definition and sources
Adjusted monetary base	end of month; until 1990:6 West Germany; source: Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Lage (upon request)
Consumer price index	seasonally adjusted; source: Deutsche Bundesbank, Saisonbereinigte Wirtschaftszahlen, Table III. 23 (new classification)
DM/USD exchange rate	monthly or quarterly averages; source: Deutsche Bundesbank, Monatsberichte, Table X.10
Gross domestic product (real)	seasonally adjusted; source: Deutsche Bundesbank, Saisonbereinigte Wirtschaftszahlen, Table II.1 (new classification)
M3	end of month data until 1989, monthly averages since 1990; until 1990:12 West Germany; seasonally adjusted; source: Deutsche Bundesbank, Saisonbereinigte Wirtschaftszahlen, Table I.1 (new classification)
Central bank money	monthly averages, seasonally adjusted; source: Deutsche Bundesbank, Monatsberichte, Table 1.3
Unemployment rate	as a percent of employable persons in the non-military sector; seasonally adjusted; source: Deutsche Bundesbank, Saisonbereinigte Wirtschaftszahlen, Table II.8 (new classification)

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Declaration of Authorship

Eidesstattliche Erklärung

Hiermit erkläre ich, die vorliegende Dissertation selbständig angefertigt und mich keiner anderen als der in ihr angegebenen Hilfsmittel bedient zu haben. Insbesondere sind sämtliche Zitate aus anderen Quellen als solche gekennzeichnet und mit Quellenangaben versehen.

Mannheim, 20.5.14

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