INTEREST RATE PASS-THROUGH IN AN ENLARGED EURO ZONE

by

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Abstract

This study investigates interest rate pass-through convergence for the eight Central and Eastern European countries (CEECs) that joined the European Union. Based on a unifying empirical pass-through model that allows for thresholds, asymmetric adjustment, and structural changes we find that the pass-through in many CEECs has become faster over time and is generally more complete than in the euro zone. We find evidence for convergence across CEECs with market concentration, bank health, foreign bank participation and monetary policy regime as conditioning factors. No convergence of the CEEC pass-through is found vis-à-vis the heterogeneous euro zone.

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1. Introduction

The eastern enlargement of the European Union in 2004 will soon be followed by an eastern enlargement of the euro zone. Will this lead to a more divergent transmission of monetary policy within the euro zone? Or has the transmission process in the eight Central and Eastern European Countries (CEECs) that joined the European Union already converged towards the euro zone? If not, will membership in the EU single market and adoption of the single currency promote convergence? This study addresses these issues by focusing on the financial part of the monetary transmission mechanism, i.e. the pass-through from monetary policy interest rates to retail banking interest rates. We explore both, the potential for interest rate pass-through (PT) convergence across the eight CEECs and the potential for convergence of this group vis-à-vis the incumbent euro zone and some of its members.

Differences in the financial part of the monetary transmission – often largely driven by persisting heterogeneity in national financial structures – are commonly held responsible for differential monetary policy effects in the current European Monetary Union (EMU). These differences are confirmed in most euro-zone PT studies that are based on a variant of the pioneering work by Cottarelli and Kourelis (1994). Important contributions include BIS (1994), Cottarelli, Ferri and Generale (1995), Borio and Fritz (1995), Mojon (2000), de Bondt et al. (2002), Sander and Kleimeier (2002, 2004), Toolsema, Sturm and de Haan (2002), Heinemann and Schüler (2003), de Bondt (2004), and De Graeve et al. (2004). Typically these studies find considerable differences in the pass-through across the countries of the euro zone. Moreover, a substantial degree of short-run bank interest rate stickiness and very limited evidence for a full pass-through in the long run is found. Asymmetric adjustment of retail interest rates is also regularly documented. Finally, it is often argued that the single currency could act as a unifying force that has the potential to make the PT faster, more complete and more homogeneous. However, as argued by Sander and Kleimeier (2004), legal and cultural differences may continue to preclude full convergence in the incumbent euro zone. So can

convergence towards a heterogeneous aggregate euro zone be meaningful? To address this issue comprehensively, we investigate three different concepts of convergence: convergence across CEECs, convergence of CEECs towards an aggregate euro zone and towards a few selected incumbent euro-zone countries chosen as representatives for different legal families.

Given the diverse macro-economic developments and financial structures in the new EU member countries, one might hypothesize that a wider euro zone will lead to an even more heterogeneous monetary policy transmission process. By now there exist only very few PT studies for CEECs. These are often limited individual countries such as the studies by Opiela (1999), Wróbel and Pawłowska (2002), and Chmielewski (2004) for Poland, and Horváth, Krekó and Naszódi (2004) for Hungary or they relate to selected countries only such as Crespo-Cuaresma et al. (2004) and Kot (2004) who compare the Czech Republic, Hungary and Poland. In all studies short-run stickiness of retail interest rates is confirmed. The latter two studies furthermore report evidence for a heterogeneous pass-through process across market interest rates and across the three countries. However, the existing CEEC PT is not carved in stone. In particular, an integrated banking market is generally considered a precondition for a smooth, efficient and homogeneous PT. For the euro-zone incumbents, recent research has shown that the emergence of an integrated European banking market is much slower than expected[1], mainly due to a lack of cross-border lending and cross-border mergers and acquisitions. In contrast, in CEECs participation of foreign banks is substantial and may thus play an important role for both, an eventual emergence of an integrated banking market and a more homogeneous PT process. Furthermore, monetary stability can have an important homogenizing impact on the PT via low inflation and low volatility of market interest rates (see e.g. Mojon 2000, Sander and Kleimeier, 2004). Thus, an adoption of the

[1] Recent overviews on financial integration in the euro zone are given by Freixas (2003) and Baele et al. (2004). While the latter study predominantly uses so-called beta- and sigma-convergence measures, Kleimeier and Sander (2000, 2003) and Schüler and Heinemann (2002) investigate retail banking market integration using cointegration methodology. For an application of the cointegration approach to CEECs see Brada, Kutan, and Zhou (2005).

euro may lead to more convergence. Our study will address these issues and is thus not only the first to investigate comparatively the PT in all eight EU transition countries, but also to analyze the PT determinants in order to explore the potential for convergence.

Our research strategy is as follows: We start by modeling the PT-process using the unifying approach advocated in Sander and Kleimeier (2004) for all eight CEEC countries, for the aggregate euro zone, and for the four individual euro-zone member countries selected as representatives of the four "legal families". In order to take care of structural changes in the CEECs we follow Brada, Kutan, and Zhou (2005) and apply a rolling regression approach. The obtained PT coefficients are then used to investigate convergence over time. We study both, convergence across the CEECs and convergence vis-à-vis the aggregate euro zone and its four representative members. The plan of the paper is as follows. Section 2 introduces the methodology and describes the data. Section 3 analyzes the PT in CEECs and its convergence within the region. Section 4 analyzes CEEC PT convergence vis-à-vis the euro zone. Section 5 concludes.

2. Data and Methodology

Our study focuses on eight CEECs Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, and Slovenia, the aggregate euro zone and the four countries chosen as representative for the different legal families Finland, Germany, Ireland, and Spain. For CEECs we collect monthly data from January 1993 to December 2003 for retail interest rates on mortgages, consumer loans, short- and long-term corporate loans, current account deposits, time deposits and savings accounts. For the aggregate euro zone these series are only available as off January 1996. We therefore start the sample for individual euro-zone countries also in 1996. It should also be noted that the ECB discontinued their retail interest rate statistics in the second half of 2003. Thus, we cannot extend our analysis beyond 2003. As a proxy for the central bank‘s policy rate we use a one-month

money market rate. Our data sources are the web-sites of the national central banks for CEEC data. Euro-zone data are obtained from the ECB.[2]

To account for any structural changes in the CEECs' national banking markets we conduct our analysis for five-year rolling sub-periods starting in 1993. This leads to a total sample of 358 observations of which 102 are loan observations and 256 are deposit observations. In order to investigate convergence towards the incumbent euro zone we have chosen to investigate convergence towards a structural-break free "post-break" period for the aggregate euro zone and the four representative euro-zone countries. Here we determine structural breaks endogenously using a rolling Chow-test methodology described in detail in Hansen (1992).

We model the empirical PT analysis by applying the unifying approach advocated in Kleimeier and Sander (2004). This approach utilizes VAR and cointegration methodologies, allows for asymmetric and threshold adjustment and follows an automatic model selection procedure. Doing so has the advantage that the CEEC results obtained here are directly comparable with the euro-zone results obtained in that earlier study. The PT model can take one of three basic forms:

$$BR_t = \beta_0 + \sum_{i=1}^{k^*} \beta_{BR,i} BR_{t-i} + \beta_1 M_t + \sum_{i=1}^{n^*} \beta_{M,i} M_{t-i} + \varepsilon_t \quad (1)$$

$$\Delta BR_t = \sum_{i=1}^{k^*} \beta_{BR,i} \Delta BR_{t-i} + \beta_1 \Delta M_t + \sum_{i=1}^{n^*} \beta_{M,i} \Delta M_{t-i} + \varepsilon_t \quad (2)$$

$$\Delta BR_t = \sum_{i=1}^{k^*} \beta_{BR,i} \Delta BR_{t-i} + \beta_1 \Delta M_t + \sum_{i=1}^{n^*} \beta_{M,i} \Delta M_{t-i} + \beta_{ECT} ECT_{t-1} + \varepsilon_t \quad (3)$$

$$BR_t = \theta_0 + \theta M_t + u_t \quad (4)$$

$$ECT_{t-1} = u_{t-1} \quad (5)$$

where BR_t and M_t are national retail and money market rates, respectively, and k* and n* indicate the optimal lag lengths.[3] Equation (1) describes the PT as a standard model in levels

[2] A full description of the data is available from the authors upon request.

(STD_LL) and is chosen when interest rates are I(0). When interest rates are I(1), the empirical PT model is best estimated using first differences as stated in equation (2). This standard specification (STD) leads to a loss of information about long-run relationships, which can be recovered if BR and M are cointegrated. By estimating the long-run cointegration relationship (4), an error correction term (ECT) can be obtained as shown in equation (5) and equation (2) then needs to be augmented by a lagged (ECT_{t-1}) as shown in equation (3).[4] If the ECT is defined as in equation (5), a symmetric adjustment model (SYM) is estimated where the adjustment mechanism is independent of the state of the dis-equilibrium. Next to the symmetric error-correction process we also consider several asymmetric specifications. These state-dependent models all belong to the group of threshold autoregressive (TAR) models and differ with respect to the definition of the ECT:

$$ECT_{t-1} = I_t\, u_{t-1} + (1- I_t)\, u_{t-1} \quad \text{with } I_t = 1 \text{ if } u_{t-1} \geq a_0^* \text{ and 0 otherwise} \tag{6}$$

$$ECT_{t-1} = \sum_{j=1}^{3} \rho_j I_j u_{t-1} \quad \text{with } I_{jt} = \begin{cases} I_{1t} = 1 & \text{if} \quad u_{t-1} \geq a_0^* \quad \text{and} \quad 0 \quad \text{otherwise} \\ I_{2t} = 1 & \text{if} \quad |\, u_{t-1} \,| < a_0^* \quad \text{and} \quad 0 \quad \text{otherwise} \\ I_{3t} = 1 & \text{if} \quad u_{t-1} \leq -a_0^* \quad \text{and} \quad 0 \quad \text{otherwise} \end{cases} \tag{7}$$

$$ECT = I_t\, \rho_1\, \Delta u_{t-1} + (1-I_t)\, \rho_2\, \Delta u_{t-1} \quad \text{with } I_t = 1 \text{ if } \Delta u_{t-1} \geq a_0^* \text{ and 0 otherwise} \tag{8}$$

A first state-dependent adjustment mechanism allows for differing adjustment speed above or below a given threshold a_0^*. In the simplest case of the TAR^0 model this threshold is set to zero, typically implying different adjustment speed to rising versus falling money market rates. Thus, the ECT is defined in equation (6) where I_t represents a Heaviside indicator for different states of u_{t-1} and $a_0^* = 0$. The second asymmetric model, TAR*, is a modification of the TAR^0 such that the threshold a_0^* is now allowed to deviate from zero. The third variation is a Band-TAR model (B-TAR*) defined in equation (7) which can reflect interest rate smoothing as well as interest rate stickiness. Finally, our fourth and fifth asymmetric models

[3] Whenever an optimal lag length has to be determined, the minimum AIC criterion is used allowing for a maximum of four lags.
[4] For unit root and cointegration methodology see Sander and Kleimeier (2004).

represent momentum threshold autoregressive models (M-TAR^0, M-TAR*) defined in equation (8) where the adjustment depends on the speed of deviation from equilibrium. M-TAR adjustment can reflect behavior by banks, which attempt to smooth out large market rate changes. In order to find the empirical PT model that optimally fits the data we follow an (almost) automatic model selection procedure that is illustrated in Figure 1.[5] We conduct this selection process for each of the rolling sub-periods. Since it is our objective to select for each national retail rate the same PT model across all sub-periods, we need a decision rule to select one and only one PT model. Our first rule is to choose the model that occurs in the absolute majority of all rolling sub-periods. If no model has the absolute majority, we repeat the estimation and selection procedure for the full sample period and choose this model also for all sub-periods. For the aggregate euro zone and the four member countries this is not necessary as only one post-break period exists. Based on the selected PT model, we obtain multipliers of different time horizons (impact, 1, 3, 6, 12 months, and long run) and different interest rate shocks (-1%, -0.25%, +0.25%, +1%).[6]

(Insert Figure 1 about here)

The estimated PT multipliers are used to investigate heterogeneity and convergence. First, we explore country and market differences as well as structural changes over time. To do so, we use a panel regression approach to test for PT differences across countries, markets and sub-periods and regress all multipliers of a specific time horizon (h) on dummies for country- (c), market- (m), and time- (t) specific effect as indicated in equation (9):

$$h\_multiplier_{c,m,t} = \alpha_0 + \sum_{c=1}^{C} \alpha_c dummy_c + \sum_{m=1}^{M} \alpha_m dummy_m + \sum_{t=1}^{T} \alpha_t dummy_t + \varepsilon_{c,m,t} \quad (9)$$

[5] For cointegration testing in TAR-type models see Enders and Siklos (2000). Regarding the determination of the optimal threshold a_0* see Chan (1993).
[6] With respect to the calculations of multipliers see Sander and Kleimeier (2004).

Additionally we use dummies for different types of monetary policy shocks to explore the existence and nature of potential asymmetries. This approach is used for both, a pure CEEC panel to investigate intra-regional convergence and a panel with the euro zone as a convergence benchmark.

In a second step we explore convergence forces further. In order to analyze *intra-CEEC convergence* in more depth we replace as many dummies as possible by macro-economic control variables and financial structure variables. This strategy has been followed by Sander and Kleimeier (2004) for the euro zone and has let to the conclusion that significant legal family dummies remain significant, i.e. there are strong forces against convergence. Since we are replicating the same methodology we do not redo this exercise here for the euro zone. Concentrating on CEECs we have collected a large number of macro-controls and financial market descriptors. Table 1 gives an impression of the development of these data over time. After some experimenting we have settled for two macro control – money market rate volatility (*mmvol*) defined as the standard deviation of the monthly money market rates for the respective rolling period and country under consideration and *inflation* defined as the percentage change on the previous year's average annual harmonized index of consumer prices (European Commission, 2004: Table 35). With respect to financial market descriptors we have finally selected three. The data for the first two financial structure variables are collected as annual observations from the EBRD Transition Reports for 2002 and 2003. To obtain a measure of foreign competition we employ the EBRD's number for domestic and foreign-owned banks. We construct *frgbankp* as the number of foreign banks as per cent of all banks.[7] As a measure of bank health we use *badloan* defined as non-performing loans in per

[7] The EBRD defines "Number of banks (foreign-owned)" as: "Number of commercial and savings banks, excluding cooperative banks. Foreign-owned banks are defined as those with foreign ownership exceeding a 50 per cent share, end-of-year".

cent of total loans.[8] Finally, our third proxy *CR3* measures the annual concentration of the national banking market and is obtained from the World Bank (2003) Financial Development and Structure Database. *CR3* is defined here as assets of the three largest banks in per cent of assets of all commercial banks in the country. To correspond to our five-year rolling samples, all annual structural variables are converted to five-year averages.

(Insert Table 1 about here)

To explore *convergence vis-à-vis the euro zone* we employ the concept of sigma convergence. This concept suggests that convergence be best measured as a reduction in cross-country variation over time. Our sigma (σ) variable is defined as the variation of individual country (c), market (m), and time period (t) multipliers against the corresponding multipliers of the benchmark region or country (x) in a structurally stable post-break period t*:

$$\sigma_x = \frac{|\, h\_multiplier_{c,m,t} - h\_multiplier_{x,m,t^*} \,|}{h\_multiplier_{x,m,t^*}} \qquad (10)$$

By regressing σ on a time trend, we test for a significant reduction of cross-country variation over time indicating sigma-convergence.

3. The Pass-Through and its Convergence across CEECs

3.1. The Pass-Through in CEECs

From our PT regressions we obtain multipliers for all CEEC retail interest rates and seven different overlapping periods. Table 2 provides simple averages of the multipliers to

[8] The EBRD variable "Non-performing loans (in per cent of total loans)" is defined as: "Ratio of non-performing loans to total loans. Non-performing loans include substandard, doubtful and loss classification categories for loans, but excludes loans transferred to a state rehabilitation agency or consolidation bank, end-of-year."

illustrate our core findings.[9] First, it appears that over time the changes in the CEEC PT exhibit a V-shaped adjustment, i.e. the impact and very short-run multipliers have decreased over time, while long(er)-run multipliers have increased over time. Second, loan markets but not deposit markets show on average a full PT which stands in contrast to the results obtained for the aggregate euro zone. Third, but not shown in Table 2, the PT is typically most efficient with respect to lending to the corporate sector and least efficient with respect to current account and savings deposits.

(Insert Table 2 about here)

To test for statistical significance of these observations we use the second-stage regressions as defined in equation (9) and reported in Table 3.[10] Taking into account the differences in loan and deposit markets we split the sample into two separate panels.[11] Panel A reveals that the *long-run* PT in the loan market differs somewhat across countries, however, only in Estonia (lower), the Slovak Republic (lower) and Slovenia (higher) we find statistically significant differences in the long-run PT. Generally the PT has improved in the long run so that loan markets are often characterized by a full PT and no significant differences across loan types are detected. It should however be noted that average long-run multiplier is 0.91 for short-term corporate and 1.07 for long-term corporate loan rates, respectively. For consumer loans the average is 0.59, but the insignificant consumer loan dummy in our panel regression is caused by a high standard deviation for consumer loan multipliers, thus revealing a high degree of heterogeneity in the consumer credit products and

[9] Detailed results for this as well as all future analyses are available from the authors upon request.
[10] For convenience we only report multipliers for a +0.25% shock.
[11] When trying to explain market characteristics by variables describing financial market structures one can show – as expected – that these variables have different effects in loan and deposit markets. These can be captured by multiplying the structural variables with a loan or deposit market dummy (see Sander and Kleimeier, 2004), respectively, or by splitting the sample into two separate panels. Since we do have ample observations due to our rolling regression approach we opt here for the second alternative.

the corresponding data.[12] Rather than in the *size*, differences are more pronounced in the *speed* of the PT. Particularly, short-run adjustment is significantly faster in corporate loan markets. Finally, we find a significant reduction in the very short-run PT speed over time. Thus, the V-shaped change of the PT process is confirmed for the loan market. From Panel B one can observe that there is much more variation in the deposit than in the loan market. This is indicated by significant country and market dummies and points to more heterogeneity within and across national deposit markets. Again, we find statistically significant V-effects, i.e. short run multipliers have decreased and long-run multipliers have increased over the past decade.

(Insert Table 3 about here)

We have also explicitly tested for asymmetries by means of constructing a large panel using all multipliers for all types of shocks (positive, negative, small, and large). However, we found multipliers to be very similar and independent of the size or direction of the monetary policy shock.[13] This lack of asymmetry is confirmed by Crespo-Cuaresma, Égert and Reininger (2004) for the Czech Republic, Hungary and Poland and by Chmielewski (2004) for Poland. For Hungary, however, Horváth, Krekó and Naszódi (2004) report asymmetries depending on the size of the changes in money market rates and the size of the deviation from long-term equilibrium.

In sum, we find a quiet homogeneous PT in CEECs. In lending markets a full PT can often be observed. Both results are standing in some contrast to the more heterogeneous and less perfect PT in the euro zone. Finally, the V-shape time pattern of the adjustment of

[12] Chmielewski (2004) also finds similarly high long-run multipliers for Polish corporate loan rates and a smaller long-run multiplier for consumer credit rates.
[13] This result is not surprising since we select an asymmetric model in only about one quarter of all cases. This is partly due to the fact that asymmetry is indeed rejected but is also influenced by our decision to use only one model per country and market.

multipliers suggests that the monetary regime (as measured by money market rate volatility), macro-economic developments, financial reform and changes in the financial structure may have played an important role in changing the monetary transmission process in CEECs. These PT determinants are explored in more detail in the following section.

3.2. Structural Determinants of the Pass-Through in CEECs

We have experimented with several financial structure variables and macro-controls in second-stage regressions separated for loan, deposit, and – given the significant differences in the deposit markets – time deposit markets. This allows us not only to identify the most important structural determinants but also to investigate whether and to what extent country or market characteristics are eventually precluding full convergence across CEECs. To control for differing macroeconomics conditions we have initially included GDP growth, inflation, financial development (as measured by the ratio of credit to GDP) and money market rate volatility. The financial development variable, however, is not systematically explaining the PT pattern while at the same time introducing multicollinearity problems. GDP growth is found to be insignificant in all regressions and the goodness of fit is typically higher without this variable. For the subsequent analysis we therefore opt to exclude these two macro-controls. When investigating the role of inflation in an approach using macro-controls only, we find that higher inflation leads to a somewhat higher *speed* of the PT process after several months and also increases the long-run multipliers. These effects weaken somewhat when introducing financial market structure variables, but we find them important enough to include *inflation* even in a very parsimonious approach. A special role is played by money market rate volatility (*mmvol*). Studies have shown that money market volatility is positively correlated with interest rate margins (e.g. Saunders and Schumacher, 2000) and negatively correlated with the PT (Mojon, 2000; Sander and Kleimeier, 2004). Here we confirm these results as we find that a lower volatility has a positive impact on the *size* and the *speed* of the

PT after some 6 months. However, the impact and early interim multipliers show the opposite result. This may reflect the need to adjust loan rates somewhat faster under a more unstable monetary policy regime, while in the longer-term this regime would in fact slow down the transmission, reduce the PT and thus eventually lead to higher intermediation margins. This effect is confirmed independent of the specification of the subsequently discussed regressions, which contain alternative financial structure descriptors. As the latter variables have different effects in loan and deposit markets we analyze their role in separate panels (see Table 4).

(Insert Table 4 about here)

Our final specification includes next to *mmvol* and *inflation* measures of banking market concentration (*CR3*), bank health (*badloan*), and foreign bank participation (*frgbankp*). The first two variables have the expected sign, are statistically significant and help to explain around 50 per cent of the loan market multiplier variations in CEECs. The last variable *frgbankp*, however, carries in a first estimate an implausible negative and significant coefficient. We hypothesize that this counterintuitive result may largely be due to the inclusion of Slovenia. From the individual country multipliers we know that the pass-through is faster and more complete in Slovenia than in other countries. As could be seen from Table 1, however, the asset-share of Slovenia's state-owned banks remained extraordinarily high with over 40 per cent for the whole sample period. At the same time its share of foreign bank participation of about 11 per cent is very low by CEEC standards.[14] When introducing a Slovenia dummy, the counterintuitive result for foreign bank participation indeed disappears. Our preferred specification of the loan market multiplier determinants is thus given in Panel A

[14] Opiela (1999: 5) argues that the central bank may play the role of an oligopolistic leader and thus may try to "…reduce loan rate stickiness through signaling a desire for loan rates to change by altering the administrative rate. This practice is not only widespread, but may also have more relevance in an economy dominated by state-owned banks whose managers have been used to following administrative orders rather than subtle market signals."

in Table 4. Here we show that foreign participation leads indeed to a faster PT process. The long-run PT is not affected by this variable because there is already strong evidence for a full PT. Nevertheless, even then the Slovenia dummy, but only the Slovenia dummy remains significantly positive. Finally, all time dummies are insignificant and are consequently dropped. The results therefore suggest *conditional convergence*: If concentration, bank health, and the monetary policy regime will converge, so will the financial part of the monetary transmission process in CEECs. This conditional convergence feature distinguishes the new EU members and potential euro-zone newcomers from the much more heterogeneous incumbents.

Turning to deposit markets as reported in Panel B of Table 4, our final regressions show that the specification reached for the loan market is also the most appealing here. Less concentration, less bad loans, and more foreign participation (in all countries but Slovenia) lead to a faster PT. The Slovenia dummy remains positive and significant. Money market rate volatility has a special impact here: The higher it is, the faster the PT in the very short run. But it has little or no impact on the longer-run multipliers or even on the completeness of the PT. Likewise, higher inflation leads to a faster PT only in the interim period. A more stable monetary policy regime with low inflation has thus the potential to slow down the PT in the medium term.

Since we find current account and saving account rates reacting much slower than time deposit rates and given the large amount of data on time deposit rates we also run separate PT regressions for time deposits. Panel C in Table 4 reveals that most results of the deposit regressions can be confirmed. Additionally, we can show that the PT is faster for short maturities and time deposits from the corporate sector. In the latter case the PT is also more complete.

In sum, the PT in CEECs is quite efficient and homogeneous, with the potential for conditional convergence depending on a unified monetary regime and integrating financial

structures. Moreover, foreign bank participation has a positive effect on retail interest rate flexibility in the short run.

4. CEEC Convergence towards the Euro Zone?

Our results for the CEECs stand in sharp contrast to the pattern found in the euro zone where "legal and cultural differences may continue to preclude full convergence" (Sander and Kleimeier, 2004: 490). As such it is questionable what convergence towards a heterogeneous euro zone should mean. First, we will therefore explore convergence not only vis-à-vis an artificially aggregated euro zone but also vis-à-vis legal family representatives. Here in particular, Germany will stand for the German legal family, Finland for the Scandinavian legal family, Spain for the French legal family, and Ireland for the British legal family. A second issue is what convergence means when the region towards which convergence is measured is itself moving. Of course, when both sides are moving convergence still makes sense. But if the PT in the euro zone is stable, it is more advisable to test for convergence against a break-free post-break period. In fact, we are able to obtain post-break periods for the aggregate euro zone with breaks located between late 1997 to early 1999. These breaks are generally compatible with the individual-country breaks documented in Sander and Kleimeier (2004) and will thus be used in the subsequent convergence analysis. These post-break periods have the advantage of being longer than the rolling periods and thereby make the results of the PT analysis more reliable. Our estimates of the aggregate euro zone's as well as the individual countries' PT are in line with the findings in the literature: short-run stickiness, no long-run full PT, and large country differences. Table 2 illustrates.

For our convergence analysis we first construct a panel of multipliers with the aggregate euro zone as the benchmark region (Table 5). An initial observation is that time dummies are generally not significant with exemption of very recent changes in the long-run multipliers for deposits. Second, the country dummies indicate no clear relative PT

performance of CEECs vis-à-vis the aggregate euro zone: Some countries are faster, some slower, some do not differ significantly. Third, having controlled for country effects, it is remarkable that the PT speed for corporate loans are significantly higher than for mortgages or consumer loans. Similarly with respect to deposits, the negative dummies for savings and current account deposits indicate relatively more speed and size for the time deposit PT.

(Insert Table 5 about here)

In a second step, we employ the concept of σ-convergence. We report the results in Table 6 and can make three observations: First regarding the absolute value of the variation as shown in intercepts, second regarding changes over time based on the trend variable, and third regarding product-specific effects based on the loan- and deposit-type dummies. Regarding the absolute value of sigma vis-à-vis the aggregate euro zone, we find that loan markets are showing more heterogeneity than deposit markets with value for the intercept almost twice as high. Moreover, heterogeneity is most pronounced in short-run adjustments. Over time short-run heterogeneity is increasingly reduced as CEECs are "converging" towards the euro zone's higher loan rate stickiness. With respect to financial products, private households are typically facing more heterogeneity than the corporate sector as it is signified by the positive dummies for consumer loans as well as for current account and savings deposits.

While little evidence for convergence towards an aggregate euro-zone PT is found, will then one or several representative countries do a better job to act as a "role model"? From the sheer numbers, the CEEC PT is furthest away from the German loan PT. This is particularly true in the long run where Germany is often far away from a full PT. Nevertheless, the reduction in short-run PT in CEECs brings these countries closer to German

and Spanish lending rate stickiness. On deposit markets the evidence is more mixed given the variety of deposit models. [15]

(Insert Table 6 about here)

In sum, we find little evidence for convergence neither towards an aggregate euro-zone PT nor towards a role-model PT. At the current moment it would thus be premature to talk of convergence. However, two observations already made in the previous section remain relevant: The short-run price flexibility in CEECs is getting lower, while there is a trend towards a more complete PT in the long run. The first observation makes the CEECs converge towards the incumbent euro zone. The latter observation distinguishes them from the incumbents.

5. Conclusions

The messages from our analyses are straightforward: First, the PT in CEEC is generally faster and – in particular – more complete than in the incumbent euro zone. Second, most PT differences within the CEECs can be explained by a handful of financial structure variables and macro-controls. To put it in a nutshell, there may be a high potential for an emerging homogeneous transmission process across CEECs. Convergence across CEECs can be predicted with market concentration, bank health, foreign bank participation and monetary policy regime as conditioning factors. Third, financial structure and macro-economic convergence can thus be expected to "produce" monetary transmission convergence. Consequently, with the help of a more competitive market structure, a healthier banking system, higher foreign bank participation – the ultimate objectives of the internal market

[15] The sigma convergence results towards Finland in deposit markets should be read with reservation. They are driven by insignificant multipliers for Finish deposits markets, which are often close to zero or – at times – even negative. Thus, this particular panel does not allow a meaningful interpretation of the results.

project – and membership in the euro zone, the newcomers may develop a quite homogeneous monetary transmission region. This may, fourth, lead to a situation where a relatively homogenous monetary transmission region may join a much more heterogeneous incumbent euro zone. Fifth, we do not find much evidence for convergence towards the euro zone. While the reduction of short-term multipliers has let to some convergence, the trend towards a full PT has increased divergence. Consequently, demand for convergence does not necessarily mean that newcomers *should* become like the incumbents! The limitations of the PT in the euro zone are indeed a policy issue. Convergence in euro-zone PT is not an end in itself. The goal should rather be that banking markets work efficiently and competitively in both, the CEECs and the incumbent euro zone. Financial and PT convergence will then follow suit.

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Figure 1: Selection of the optimal pass-through model

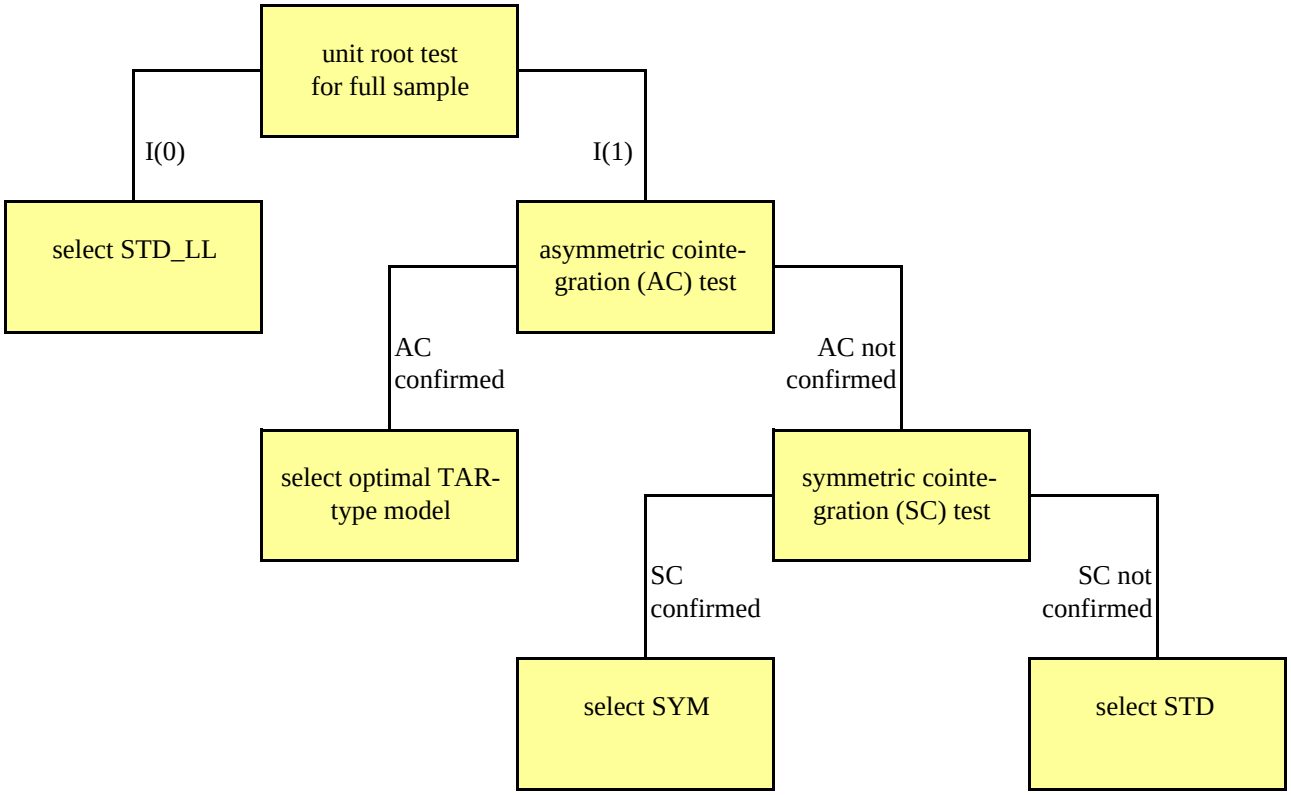

Table 1: Macro-economic development, financial sector development and financial structure in CEECs

	macro-economic development[1]			financial sector development					financial structure		
	growth (in %)	inflation (in %)	money market rate volatility	EBRD index of banking sector reform[2]	private credit to GDP (in %)	stock market capitalization (in % of GDP)	net interest margin (in %)	non-performing loans in % of total loans	CR 3 asset concentration (in %)	share of foreign banks in % of all banks	asset share of state-owned banks (in %)
Czech Republic											
1995	1.8	6.4	4.6	3.0	47	30	3.0	27	47	42	18
2002[3]	2.4	2.3	1.7	3.7	20	21	3.1	9	48	70	5
Estonia											
1995	4.4	10.3	4.0	3.0	14	na	8.0	3	58	26	10
2002[3]	4.8	3.5	2.1	3.7	30	34	4.0	1	80	57	0
Hungary											
1995	3.3	16.6	4.5	3.0	23	6	5.6	7[4]	44	49	49
2002[3]	3.9	7.8	2.8	4.0	34	17	5.5	5	36	71	11
Latvia											
1995	3.6	4.8	7.1	3.0	8	0	6.7	19	44	26	10
2002[3]	6.2	2.4	1.4	3.7	33	8	3.4	2	35	63	4
Lithuania											
1995	5.4	9.8	9.1	3.0	12	3	10.0	17	69	0	62
2002[3]	4.9	0.4	2.0	3.0	14	10	3.9	6	67	29	0
Poland											
1995	5.7	11.3	4.5	3.0	13	4	7.5	24	43	22	72
2002[3]	2.8	5.1	4.4	3.3	15	14	3.2	25	37	76	27
Slovak Republic											
1995	4.4	7.2	5.5	2.7	26	7	3.0	41	78	55	61
2002[3]	3.2	8.4	3.1	3.3	25	7	2.8	11	61	83	3
Slovenia											
1995	4.3	8.1	3.8	3.0	27	2	4.1	9	53	15	42
2002[3]	3.6	7.4	1.1	3.3	41	19	3.3	10[5]	56	27	49

[1] The data for macro-controls relate to period averages 1995-1999 and 1999-2003. respectively. [2] Bankreform ranges from 1 to 4+ with a higher index number reflecting further-reaching reforms. [3] The data for private credit, CR3 and net interest margin relate to 2001. [4] Data relate to 1997. [5] Data relate to 2001.

Sources: Growth (average real GDP growth rate) and inflation (average annual harmonized index of consumer prices): own calculations from Eurostat (2004). Money market rate volatility (standard deviation of 1-month money market rate: own calculation; for data sources see table A1 in the appendix. Private credit (by deposit money banks to GDP). CR 3 (defined as assets of three largest banks as a share of assets of all commercial banks in the system) and net interest margin (defined as accounting value of bank's net interest revenue as a share of its interest-bearing (total earning) assets): World Bank (2003). Stock market capitalization, non-performing loans, share of foreign banks, asset share of state-owned banks and EBRD index of banking sector reform: EBRD 2003 and own calculations.

Table 2: The pass-through in an enlarged Europe

		average loan multiplier		average deposit multiplier	
country	period	impact	long-run	impact	long-run
CEEC	1993-1997	0.77	0.78	0.49	0.44
	1996-2000	0.26	0.79	0.17	0.39
	1999-2003	0.21	0.95	0.17	0.66
euro zone	post break	0.23	0.62	0.20	0.39
Finland	post break	0.61	0.97	0.07	0.14
Germany	post break	0.23	0.42	0.31	0.51
Ireland	post break	0.51	0.65	0.11	0.20
Spain	post break	0.43	0.77	0.37	0.52

Table 3: Country, rate, and time patterns in the pass-through in CEECs

	dependent variable = multipliers for a +0.25% shock					
independent variable	impact	1 mth	3 mths	6 mths	12 mths	long-run
Panel A: Loan rates						
intercept	0.37	0.42	0.39	0.36	0.22	0.14
	2.57	*2.99*	*2.48*	*2.08*	*1.15*	*0.61*
Czech Rep	0.09	-0.08	-0.27	-0.40	-0.33	-0.27
	0.78	*-0.75*	*-2.22*	*-2.98*	*-2.24*	*-1.44*
Estonia	0.01	-0.14	-0.29	-0.36	-0.38	-0.33
	0.06	*-1.51*	*-2.82*	*-3.26*	*-3.05*	*-2.11*
Hungary	0.23	0.24	0.12	0.08	0.15	0.19
	2.71	*2.83*	*1.25*	*0.78*	*1.26*	*1.32*
Latvia	0.14	0.02	-0.10	-0.10	0.08	0.26
	1.12	*0.20*	*-0.73*	*-0.67*	*0.47*	*1.23*
Lithuania	0.07	-0.18	-0.29	-0.36	-0.22	-0.03
	0.63	*-1.54*	*-2.31*	*-2.58*	*-1.42*	*-0.15*
Slovak Rep	0.04	-0.23	-0.48	-0.64	-0.62	-0.57
	0.36	*-2.28*	*-4.38*	*-5.28*	*-4.56*	*-3.39*
Slovenia	0.36	0.38	0.43	0.50	0.68	0.84
	4.32	*4.52*	*4.59*	*4.90*	*6.00*	*5.95*
consumer loans	0.00	-0.05	0.00	0.01	-0.02	-0.10
	0.07	*-0.69*	*0.00*	*0.13*	*-0.25*	*-0.84*
short term corporate loans	0.26	0.22	0.27	0.26	0.23	0.14
	3.66	*3.06*	*3.40*	*3.08*	*2.46*	*1.22*
long term corporate loans	0.23	0.20	0.25	0.24	0.21	0.14
	3.21	*2.78*	*3.12*	*2.76*	*2.19*	*1.15*
1994-1998	-0.05	0.02	0.03	0.02	0.02	0.02
	-0.37	*0.15*	*0.16*	*0.14*	*0.11*	*0.09*
1995-1999	-0.34	-0.10	0.09	0.26	0.36	0.40
	-2.71	*-0.81*	*0.66*	*1.75*	*2.16*	*1.92*
1996-2000	-0.44	-0.21	0.04	0.20	0.31	0.39
	-3.58	*-1.72*	*0.29*	*1.36*	*1.86*	*1.88*
1997-2001	-0.38	-0.14	0.16	0.37	0.55	0.65
	-3.19	*-1.15*	*1.18*	*2.60*	*3.42*	*3.23*
1998-2002	-0.43	-0.24	0.02	0.19	0.36	0.47
	-3.61	*-2.04*	*0.16*	*1.35*	*2.26*	*2.35*
1999-2003	-0.40	-0.24	0.04	0.25	0.45	0.70
	-3.39	*-2.02*	*0.31*	*1.76*	*2.82*	*3.55*
adjusted R^2	50%	62%	65%	67%	67%	60%
Panel B: Deposit rates						
intercept	0.42	0.45	0.62	0.64	0.54	0.37
	7.24	*6.74*	*7.70*	*7.60*	*5.60*	*2.57*
Czech Rep	-0.03	-0.19	-0.37	-0.42	-0.38	-0.29
	-0.85	*-4.00*	*-6.61*	*-7.12*	*-5.54*	*-2.85*
Estonia	0.17	0.02	-0.21	-0.32	-0.31	-0.30
	3.77	*0.38*	*-3.43*	*-4.83*	*-4.18*	*-2.71*
Hungary	0.12	0.16	0.20	0.16	0.11	0.10
	2.49	*2.74*	*3.01*	*2.18*	*1.36*	*0.83*
Latvia	0.04	-0.10	-0.34	-0.43	-0.45	-0.57
	0.77	*-1.77*	*-5.00*	*-6.06*	*-5.49*	*-4.66*
Lithuania	-0.13	-0.19	-0.41	-0.47	-0.41	-0.28
	-3.66	*-4.67*	*-8.37*	*-8.95*	*-6.82*	*-3.10*
Slovak Rep	-0.09	-0.23	-0.50	-0.61	-0.61	-0.59
	-2.47	*-5.19*	*-9.50*	*-10.87*	*-9.50*	*-6.13*
Slovenia	0.22	0.22	0.12	0.16	0.30	0.53
	5.68	*4.77*	*2.19*	*2.76*	*4.59*	*5.44*
current account deposits	-0.12	-0.24	-0.50	-0.57	-0.55	-0.46
	-2.20	*-3.94*	*-6.74*	*-7.40*	*-6.16*	*-3.45*
savings accounts	-0.18	-0.22	-0.31	-0.38	-0.43	-0.50
	-4.94	*-5.17*	*-6.07*	*-6.91*	*-6.86*	*-5.37*
1994-1998	-0.01	0.13	0.18	0.19	0.20	0.22
	-0.17	*1.86*	*2.14*	*2.17*	*2.04*	*1.50*
1995-1999	-0.21	-0.08	0.06	0.13	0.20	0.27
	-3.76	*-1.19*	*0.76*	*1.64*	*2.07*	*1.95*
1996-2000	-0.24	-0.13	-0.01	0.07	0.15	0.24
	-4.38	*-2.08*	*-0.08*	*0.91*	*1.63*	*1.71*
1997-2001	-0.26	-0.14	0.02	0.13	0.26	0.38
	-4.86	*-2.14*	*0.32*	*1.60*	*2.88*	*2.78*
1998-2002	-0.28	-0.12	0.00	0.10	0.23	0.40
	-5.08	*-1.91*	*0.06*	*1.27*	*2.49*	*2.95*
1999-2003	-0.24	-0.12	0.02	0.13	0.28	0.60
	-4.40	*-1.86*	*0.23*	*1.63*	*3.06*	*4.43*
adjusted R^2	51%	51%	58%	63%	60%	48%

Note: All independent variables are dummies. For each independent variable, the first row reports the estimated coefficient and the second row reports the t-statistics in italics. In Panel A and B the regressions are based on samples of 102 and 256 observations, respectively. The samples include 1993 to 2003.

Table 4: Structural determinants of the pass-through in CEECs

	dependent variable = multipliers for a +0.25% shock					
independent variable	impact	1 mth	3 mths	6 mths	12 mths	long-run
Panel A: Loan rates						
intercept	-0.10	-0.01	0.50	0.97	1.57	2.21
	-0.37	*-0.02*	*1.52*	*2.60*	*3.80*	*4.28*
mmvol	5.32	3.37	0.72	-1.80	-3.82	-5.47
	5.68	*3.56*	*0.66*	*-1.46*	*-2.80*	*-3.20*
inflation	-1.32	0.58	0.45	1.39	1.39	0.12
	-1.79	*0.79*	*0.53*	*1.43*	*1.30*	*0.09*
CR3	-0.23	-0.44	-0.77	-0.98	-1.28	-1.47
	-1.00	*-1.86*	*-2.83*	*-3.17*	*-3.73*	*-3.45*
badloan	-0.63	-1.00	-1.19	-1.47	-1.75	-2.16
	-2.20	*-3.43*	*-3.57*	*-3.86*	*-4.16*	*-4.10*
frgbankp * (1 - Slovenia dummy)	0.50	0.66	0.49	0.10	-0.40	-0.86
	1.53	*1.97*	*1.28*	*0.22*	*-0.83*	*-1.43*
Slovenia dummy	0.59	0.77	0.79	0.65	0.47	0.26
	3.00	*3.85*	*3.45*	*2.50*	*1.62*	*0.73*
short-term corporate loan dummy	0.23	0.23	0.27	0.28	0.27	0.23
	4.62	*4.58*	*4.68*	*4.13*	*3.63*	*2.50*
long-term corporate loan dummy	0.19	0.21	0.27	0.28	0.28	0.25
	3.48	*3.96*	*4.43*	*4.04*	*3.55*	*2.55*
adjusted R^2	55%	65%	65%	65%	65%	57%
Panel B: Deposit rates						
intercept	-0.38	-0.16	0.22	0.54	0.82	1.11
	-3.55	*-1.37*	*1.43*	*3.14*	*4.05*	*3.67*
mmvol	2.75	2.91	2.01	1.35	0.59	-0.21
	9.04	*8.67*	*4.55*	*2.73*	*1.03*	*-0.24*
inflation	-0.48	0.25	2.12	2.36	2.21	0.96
	-1.26	*0.58*	*3.81*	*3.80*	*3.06*	*0.88*
CR3	0.22	0.01	-0.44	-0.70	-0.79	-0.76
	2.14	*0.09*	*-2.89*	*-4.12*	*-3.97*	*-2.56*
badloan	-0.73	-0.94	-1.32	-1.33	-1.36	-1.35
	-6.14	*-7.19*	*-7.65*	*-6.94*	*-6.06*	*-4.01*
frgbankp * (1 - Slovenia dummy)	0.89	0.78	0.70	0.48	0.18	-0.12
	7.64	*6.12*	*4.16*	*2.54*	*0.81*	*-0.36*
Slovenia dummy	0.70	0.69	0.64	0.59	0.53	0.54
	10.46	*9.34*	*6.52*	*5.42*	*4.20*	*2.82*
current account deposit dummy	-0.14	-0.21	-0.40	-0.45	-0.43	-0.29
	-2.93	*-3.90*	*-5.59*	*-5.66*	*-4.56*	*-2.08*
saving account dummy	-0.17	-0.24	-0.35	-0.42	-0.47	-0.54
	-4.76	*-6.04*	*-6.71*	*-7.27*	*-7.01*	*-5.38*
adjusted R^2	53%	59%	57%	57%	53%	37%
Panel C: Time deposit rates						
intercept	-0.49	-0.26	0.02	0.37	0.67	0.97
	-3.74	*-1.88*	*0.12*	*1.78*	*2.76*	*2.52*
mmvol	2.84	2.77	1.59	0.77	-0.18	-1.37
	7.96	*7.32*	*3.24*	*1.38*	*-0.27*	*-1.30*
inflation	-0.33	0.81	3.33	3.57	3.49	2.76
	-0.73	*1.68*	*5.35*	*5.02*	*4.16*	*2.06*
CR3	0.30	0.08	-0.25	-0.57	-0.64	-0.57
	2.25	*0.55*	*-1.35*	*-2.71*	*-2.59*	*-1.43*
badloan	-0.78	-0.99	-1.41	-1.42	-1.46	-1.56
	-5.82	*-6.90*	*-7.58*	*-6.72*	*-5.83*	*-3.92*
frgbankp * (1 - Slovenia dummy)	0.90	0.73	0.60	0.38	0.03	-0.32
	6.51	*4.95*	*3.16*	*1.76*	*0.12*	*-0.78*
Slovenia dummy	0.73	0.68	0.61	0.57	0.50	0.49
	9.21	*8.11*	*5.57*	*4.57*	*3.41*	*2.07*
short maturity dummy	0.05	0.08	0.18	0.14	0.15	0.15
	1.28	*1.89*	*3.28*	*2.23*	*2.03*	*1.26*
corporate deposit dummy	0.07	0.09	0.12	0.15	0.13	0.13
	2.91	*3.48*	*3.86*	*3.99*	*3.07*	*1.85*
adjusted R^2	56%	63%	63%	61%	57%	39%

Note: For each independent variable, the first row reports the estimated coefficient and the second row reports the t-statistic. All excluded rate, country, and time dummies were found to be insignificant. In Panela A, B and C the regressions are based on samples of 102, 256, and 197 observations, respectively. The samples include 1993 to 2003.

Table 5: Country, rate, and time patterns in the pass-through in CEECs and the aggregate euro zone

	dependent variable = multipliers for a +0.25% shock					
independent variable	impact	1 mth	3 mths	6 mths	12 mths	long-run
Panel A: Loan rates						
intercept	0.09	0.36	0.50	0.45	0.46	0.62
	1.14	*4.31*	*5.21*	*4.30*	*3.84*	*4.05*
Czech Rep	0.14	-0.02	-0.14	-0.17	-0.17	-0.25
	1.37	*-0.18*	*-1.10*	*-1.21*	*-1.09*	*-1.25*
Estonia	-0.15	-0.27	-0.29	-0.20	-0.22	-0.26
	-2.02	*-3.30*	*-3.10*	*-1.91*	*-1.91*	*-1.72*
Hungary	0.10	0.14	0.13	0.22	0.24	0.18
	1.43	*1.89*	*1.54*	*2.33*	*2.28*	*1.32*
Latvia	-0.01	-0.10	-0.10	0.08	0.25	0.35
	-0.05	*-0.91*	*-0.75*	*0.52*	*1.52*	*1.69*
Lithuania	-0.08	-0.31	-0.30	-0.19	-0.06	0.06
	-0.84	*-3.06*	*-2.55*	*-1.44*	*-0.40*	*0.32*
Poland	-0.16	-0.12	0.01	0.17	0.16	0.07
	-2.06	*-1.44*	*0.15*	*1.67*	*1.36*	*0.47*
Slovak Rep	-0.09	-0.30	-0.44	-0.44	-0.45	-0.52
	-1.01	*-3.25*	*-4.02*	*-3.71*	*-3.36*	*-3.05*
Slovenia	0.11	0.17	0.36	0.65	0.86	0.94
	1.53	*2.24*	*4.16*	*6.92*	*8.11*	*6.85*
consumer loans	-0.02	-0.11	-0.11	-0.05	-0.07	-0.16
	-0.33	*-1.68*	*-1.44*	*-0.59*	*-0.71*	*-1.31*
short term corporate loans	0.24	0.18	0.17	0.22	0.20	0.11
	3.93	*2.68*	*2.23*	*2.59*	*2.15*	*0.93*
long term corporate loans	0.24	0.16	0.17	0.20	0.19	0.08
	3.72	*2.40*	*2.17*	*2.30*	*1.92*	*0.66*
1997-2001	0.06	0.07	0.09	0.13	0.17	0.14
	0.89	*1.01*	*1.13*	*1.42*	*1.70*	*1.06*
1998-2002	0.02	0.00	0.00	-0.01	0.00	-0.03
	0.36	*-0.04*	*0.01*	*-0.13*	*0.05*	*-0.22*
1999-2003	0.04	0.00	0.00	0.02	0.07	0.17
	0.54	*-0.07*	*0.00*	*0.19*	*0.75*	*1.33*
adjusted R^2	33%	50%	56%	62%	64%	56%
Panel B: Deposit rates						
intercept	0.33	0.49	0.64	0.67	0.66	0.60
	7.12	*8.90*	*8.85*	*8.70*	*7.34*	*4.22*
Czech Rep	-0.09	-0.24	-0.27	-0.28	-0.25	-0.21
	-1.72	*-3.94*	*-3.50*	*-3.34*	*-2.63*	*-1.35*
Estonia	0.01	-0.16	-0.25	-0.27	-0.27	-0.28
	0.18	*-2.57*	*-3.06*	*-3.15*	*-2.74*	*-1.75*
Hungary	0.00	0.03	0.17	0.19	0.16	0.12
	-0.02	*0.49*	*1.96*	*2.04*	*1.52*	*0.71*
Latvia	-0.12	-0.28	-0.38	-0.39	-0.42	-0.54
	-2.23	*-4.33*	*-4.46*	*-4.34*	*-3.93*	*-3.24*
Lithuania	-0.29	-0.41	-0.50	-0.49	-0.44	-0.32
	-6.26	*-7.27*	*-6.85*	*-6.22*	*-4.88*	*-2.25*
Poland	-0.15	-0.17	-0.04	0.04	0.04	0.03
	-3.36	*-3.16*	*-0.54*	*0.51*	*0.45*	*0.24*
Slovak Rep	-0.24	-0.38	-0.50	-0.53	-0.55	-0.56
	-5.04	*-6.76*	*-6.80*	*-6.71*	*-5.96*	*-3.84*
Slovenia	-0.05	-0.04	0.07	0.25	0.43	0.71
	-1.01	*-0.63*	*0.94*	*3.06*	*4.56*	*4.78*
current account deposits	-0.15	-0.27	-0.47	-0.54	-0.55	-0.48
	-3.60	*-5.62*	*-7.43*	*-7.91*	*-6.91*	*-3.86*
savings accounts	-0.19	-0.29	-0.42	-0.50	-0.56	-0.66
	-5.34	*-6.77*	*-7.60*	*-8.39*	*-8.21*	*-6.04*
1997-2001	-0.01	0.01	0.04	0.05	0.10	0.12
	-0.48	*0.15*	*0.78*	*1.05*	*1.81*	*1.38*
1998-2002	-0.02	0.02	0.02	0.03	0.07	0.15
	-0.85	*0.57*	*0.37*	*0.55*	*1.22*	*1.64*
1999-2003	0.01	0.03	0.04	0.07	0.13	0.35
	0.43	*0.83*	*0.89*	*1.38*	*2.35*	*3.97*
adjusted R^2	41%	48%	59%	65%	63%	49%

Note: All independent variables are dummies. For each independent variable, the first row reports the estimated coefficient and the second row reports the t-statistic. In Panel A and B the regressions are based on samples of 96 and 210 observations, respectively. The samples include 1996 to 2003.

Table 6: Sigma convergence of the pass-through in CEECs towards the euro zone

	dependent variable = loan rate multiplier for a +0.25% shock						dependent variable = deposit rate multiplier for a +0.25% shock					
independent variable	impact	1 mth	3 mths	6 mths	12 mths	long-run	impact	1 mth	3 mths	6 mths	12 mths	long-run
Panel A: Convergence of CEECs towards the aggregate euro zone												
intercept	1.64	0.77	0.73	0.79	0.75	0.64	0.78	0.64	0.54	0.51	0.65	0.48
	7.36	*4.32*	*3.19*	*2.76*	*2.21*	*1.59*	*10.59*	*15.67*	*14.87*	*13.13*	*5.58*	*8.31*
consumer loans	0.16	0.77	0.94	1.11	1.27	1.43						
	0.65	*3.91*	*3.72*	*3.53*	*3.35*	*3.21*						
short term corporate loans	-0.56	0.00	-0.02	-0.10	-0.14	-0.13						
	-2.15	*-0.01*	*-0.09*	*-0.31*	*-0.36*	*-0.28*						
long term corporate loans	-0.30	-0.03	0.14	0.03	0.00	0.02						
	-1.13	*-0.13*	*0.51*	*0.08*	*0.00*	*0.04*						
current account deposits							0.24	-0.05	0.18	0.34	0.64	0.83
							1.02	*-0.40*	*1.56*	*2.73*	*1.74*	*4.59*
savings accounts							1.04	0.62	0.55	0.64	2.07	0.67
							5.90	*6.34*	*6.27*	*6.86*	*7.39*	*4.86*
time trend	-0.23	-0.11	-0.12	-0.10	-0.05	0.03	-0.05	-0.01	0.00	-0.01	-0.08	0.01
	-4.85	*-2.97*	*-2.42*	*-1.61*	*-0.69*	*0.30*	*-1.93*	*-0.75*	*-0.29*	*-0.48*	*-1.84*	*0.36*
adjusted R^2	25%	27%	22%	20%	17%	15%	13%	14%	13%	17%	19%	13%
observations	102	102	102	102	102	102	256	256	256	256	256	256
Panel B: Convergence of CEECs towards Finland												
intercept	0.81	0.42	0.51	0.80	0.76	0.33	18.57	25.09	36.63	104.51	51.13	6.97
	8.22	*5.40*	*6.30*	*8.52*	*7.07*	*3.05*	*14.05*	*15.01*	*14.58*	*14.57*	*13.83*	*11.94*
consumer loans	-0.02	0.24	0.15	-0.12	-0.11	0.27						
	-0.17	*2.89*	*1.79*	*-1.20*	*-0.93*	*2.28*						
current account deposits							-11.44	-19.52	-32.84	-101.24	-52.86	-7.15
							-2.74	*-3.70*	*-4.14*	*-4.47*	*-4.52*	*-3.88*
savings accounts							-14.29	-21.25	-33.89	-102.16	-51.66	-6.68
							-4.52	*-5.31*	*-5.63*	*-5.95*	*-5.84*	*-4.78*
time trend	0.01	0.06	0.02	-0.01	0.01	0.03	-2.22	-2.00	-1.26	-0.99	1.05	0.51
	0.59	*3.14*	*0.96*	*-0.35*	*0.45*	*1.02*	*-4.68*	*-3.34*	*-1.39*	*-0.39*	*0.79*	*2.45*
adjusted R^2	9%	31%	23%	28%	22%	12%	15%	15%	15%	16%	16%	14%
observations	75	75	75	75	75	75	256	256	256	256	256	256
Panel C: Convergence of CEECs towards Germany												
intercept	1.40	0.85	0.77	1.14	1.10	0.82	0.65	0.60	0.51	0.47	0.46	0.45
	5.34	*3.90*	*2.99*	*3.50*	*2.80*	*1.79*	*21.49*	*20.58*	*14.55*	*13.37*	*12.07*	*8.28*
consumer loans	0.48	0.79	0.98	0.90	1.04	1.30						
	1.64	*3.29*	*3.44*	*2.50*	*2.39*	*2.58*						
short term corporate loans	0.41	0.61	0.88	0.79	0.88	1.05						
	1.35	*2.43*	*2.98*	*2.10*	*1.95*	*1.99*						
long term corporate loans	0.25	-0.06	-0.04	0.17	0.38	0.19						
	0.80	*-0.24*	*-0.12*	*0.45*	*0.82*	*0.35*						
current account deposits							0.18	-0.11	0.18	0.33	0.60	0.83
							1.97	*-1.19*	*1.65*	*3.00*	*5.09*	*4.92*
time trend	-0.26	-0.15	-0.14	-0.14	-0.08	0.03	0.02	0.03	0.01	0.01	0.01	0.02
	-4.65	*-3.20*	*-2.57*	*-2.09*	*-1.00*	*0.27*	*1.75*	*2.46*	*0.57*	*1.02*	*1.04*	*0.75*
adjusted R^2	17%	22%	21%	9%	4%	6%	2%	2%	0%	3%	10%	9%
observations	102	102	102	102	102	102	236	236	236	236	236	236
Panel D: Convergence of CEECs towards Ireland												
intercept	0.76	0.54	0.63	0.66	0.56	0.47	1.63	1.35	1.43	1.25	1.29	1.36
	8.22	*7.19*	*7.20*	*5.67*	*4.01*	*2.66*	*5.49*	*7.40*	*7.35*	*9.11*	*8.79*	*7.86*
consumer loans	0.11	0.25	0.12	0.16	0.23	0.28						
	1.09	*2.97*	*1.28*	*1.20*	*1.48*	*1.40*						
short term corporate loans	-0.26	-0.06	0.07	0.22	0.35	0.51						
	-2.45	*-0.68*	*0.72*	*1.66*	*2.20*	*2.48*						
long term corporate loans	-0.23	-0.17	-0.15	0.04	0.17	0.22						
	-2.13	*-1.89*	*-1.46*	*0.31*	*1.04*	*1.05*						
time trend	-0.01	0.01	-0.03	-0.05	-0.02	0.02	-0.26	-0.16	-0.19	-0.13	-0.15	-0.12
	-0.29	*0.44*	*-1.51*	*-2.19*	*-0.70*	*0.47*	*-2.09*	*-2.10*	*-2.37*	*-2.27*	*-2.43*	*-1.66*
adjusted R^2	16%	23%	8%	5%	1%	3%	15%	15%	20%	18%	21%	8%
observations	102	102	102	102	102	102	20	20	20	20	20	20
Panel E: Convergence of CEECs towards Spain												
intercept	1.68	0.85	0.41	0.45	0.49	0.47	0.66	0.60	0.51	0.48	0.47	0.47
	9.68	*9.97*	*5.16*	*4.92*	*4.41*	*3.26*	*22.50*	*20.71*	*14.98*	*13.95*	*12.36*	*7.82*
short term corporate loans	-0.72	-0.21	-0.13	-0.02	-0.02	-0.04						
	-3.78	*-2.25*	*-1.48*	*-0.18*	*-0.20*	*-0.24*						
long term corporate loans	-0.48	-0.30	-0.25	-0.05	-0.08	-0.03						
	-2.42	*-3.13*	*-2.74*	*-0.46*	*-0.59*	*-0.16*						
current account deposits							-0.08	-0.15	-0.08	-0.08	-0.03	0.01
							-0.86	*-1.74*	*-0.79*	*-0.80*	*-0.22*	*0.08*
time trend	-0.19	-0.06	0.04	-0.01	0.00	0.04	0.01	0.03	0.01	0.01	0.02	0.02
	-4.47	*-2.65*	*2.09*	*-0.24*	*0.13*	*1.01*	*0.68*	*2.69*	*0.60*	*1.04*	*1.37*	*0.99*
adjusted R^2	32%	18%	11%	-4%	-4%	-3%	0%	3%	0%	0%	0%	0%
observations	68	68	68	68	68	68	236	236	236	236	236	236

Note: For each independent variable, the first row reports the estimated coefficient and the second row reports the t-statistic. The sample ranges from 1993 to 2003.