Is interest rate pass-through related to banking sector competitiveness?

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Abstract

This paper presents empirical evidence on the relationship between degree of competition in the banking sector and the sluggishness of interest rate pass-through in three post-accession countries and the eurozone. A quantitative measure of the market competition is proposed. The findings indicate that increase in degree of competition coincides with faster transmission of the monetary policy impulses to the consumer credit prices. A divergence between the new EU-member states investigated and the eurozone in terms of the interest rates transmission mechanism and competition patterns has been confirmed.

Introduction

There are many factors influencing the transmission channel from the central bank controlled short term interest rates to the interest rates demanded by commercial banks in the retail credit market. The list of those factors includes items like degree of maturity of the banking system, ownership structure of banks, market entry barriers, the risk level of banking business, liquidity position of the sector etc. [9]. Also the degree of competition among the banks selling credits to non-financial entities is often pointed to as one of the factors.

This papers examines whether there is a relationship between the degree of competition in the banking sector and the interest rates pass-through. Three post-accession countries – Czech Republic, Poland, Hungary – and the eurozone are investigated. By comparing the four economies it addresses the issue of convergence of the monetary transmission mechanisms between the new EU-entrants and the eurozone.

A retail credit market is not homogenous and as such it can be subdivided into corporate credit sector, households mortgage credit sector and households consumer credit sector. The transmission mechanism of the monetary impulses via the consumer credit sector is believed to be of a particular interest to central banks, because this type of loans translates directly into the consumption developments that in turn influences the inflation. For this reason the paper focuses on the consumer credit market.

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Quantitative assessment of the market competitiveness can be derived from numerous economic theories. More, there exists a diversity of practical implementations of measuring competition in a market – see [20], [19], [11], [16]. Here a measure of consumer credit market competitiveness is proposed that is based on the difference in the price elasticities of the aggregated demand and the demand for goods sold by a particular supplier. This approach is directly built up on a fact that in a competitive market the slope of an aggregated demand curve is significantly lower than the slopes of the demand curves for the goods of particular firms. Of course the aggregated demand is formed up as a sum of those particular demand curves.

The competitiveness measure proposed has been applied to quantify and compare the degree of competition in the consumer credit markets in Czech Republic, Hungary, eurozone and Poland. Aggregated credit demand elasticities with respect to interest rates were based on the long-run relationships estimated with cointegration techniques. To determine the credit demand elasticities felt by particular banks a modified Bofinger model of credit creation in commercial banks was used [1].

The four economies were also investigated with regard to the transmission from short term interest rates to household consumer credit rates. A methodology used by de Bondt [3] for the eurozone was applied to assess the sluggishness in the transmission. This enabled to sort the countries in order of the flexibility of the pass-through mechanism.

Putting together the competitiveness and interest rate pass-through results indicates that there is a relationship between the interest rate transmission and the competitive structure of the banking market. The more competitive the market, the faster and more complete are the adjustments of consumer credit rates to the shifts in short term interest rates controlled by central banks. This effect can be of a practical value to monetary authorities.

Moreover, the findings confirm that there are discrepancies between the three post EU-accession countries and eurozone in terms of the interest rate pass-through. They stem from inter alia the different competition patterns in the consumer credit markets. If the convergence towards the eurozone takes place, then Hungary and Poland approach the eurozone standards limit from other direction than the Czech Republic does.

The paper is organized as follows. The first section presents an optimization model that explains the process of setting retail interest rates in commercial banks. The model results are later applied in the next section to define a measure of market competitiveness. The third section contains empirical assessment of the degree of competition and consumer credit interest rates adjustment mechanisms in the four economies examined in the paper. Based on this conclusions are drawn as to the relationship between the two. The last section summarizes findings presented throughout the paper.

1 Setting retail interest rates in commercial banks – a model approach

This section presents a model of setting the interest rates on loans offered by commercial banks to their customers. The model is based on Bofinger [1], however some modifications have been made.

Commercial banks collect deposits and use them to grant credits. They earn the spread between the interests demanded on credits and paid on deposits. The existence of the interbank market makes the earning process two-stage. If there are no non-bank entities willing to borrow from a particular bank, the bank can still earn on deposits by lending them to other banks in the interbank market. If a bank is short of deposits, it still can grant loans by refinancing them in the interbank market. In an environment where a central bank is committed to control the level of short-term interbank market interest rates a risk of the interbank market being dry of funds is virtually none. It is so because in the case of shortages of the liquidity in the banking sector the interbank interest rates would rise. But this would violate the central bank commitment to control the rates. So the central bank would inject enough additional liquidity to make the interest rates stay unchanged. It can do so thanks to its position of the monopolistic supplier of the money. In practice, the liquidity injections (or absorptions if there is a risk of the interest rates decrease) are conducted with the use of the central bank open market operations.

So profits of a commercial bank depend on the following components:

- interests paid by its debtors on credits granted by the bank
- interests it has to pay to its depositors for the deposits collected
- interests earned from central bank on the required reserves remuneration (required reserves are usually remunerated nowadays)
- interests the bank pays on the funds borrowed in the interbank market
- constant costs and variable costs associated with the banking activity, with defaults on loans, with examination of the credit applications etc.

The same factors shape the profit function of the whole commercial banks sector, except for the interests on interbank loans, because being a cost for one side, they are an income for its counterpart. But the banking system pays costs of the liquidity injections by the central bank via the open market operations. Thus the profit function of the commercial banking sector is as follows:

$$Z = i_C\mathbb{C} - i_D\mathbb{D} + i_M r\mathbb{D} - i_R OMO - CC - VC \tag{1}$$

where

- i_R is the central bank open market operation rate; usually the short-term interbank market rates with the maturity corresponding to that of the open market operations are not much different from i_R
- i_M – interest rate paid by a central bank on the required reserves balances; quite often is close to or equals i_R
- r – required reserves ratio
- i_C – interest rate demanded by commercial banks on credits granted to their clients
- i_D – interest paid by commercial banks on deposits
- $\mathbb{C}$ – volume of credit granted by commercial bank system

- $\mathbb{D}$ – volume of deposits collected by commercial bank system
- OMO - volume of outstanding open market operations
- CC, VC - constant costs, variable costs of banking sector. The variable costs VC consist of the operation costs associated with making the credit decisions, specific provisions, risk premium, default risk, fiscal costs etc. Allowing a reasonmable degree of simplification, they can be written as a function of the volume of credit granted $\mathbb{C}$ and also a scale variable Y, proxied by for instance current GDP: $VC = VC(\mathbb{C}, Y)$.

At every instant of time the banking sector has to have its assets and liabilities equal. Simplifying the aggregate balance sheet of the banking sector leads to a following equation:

$$\mathbb{C} + r\mathbb{D} = \mathbb{D} + OMO \tag{2}$$

When the banking sector is a net borrower from central bank, the OMO is positive. In case of overliquidity in the banking sector the central banks has to absorb it, and then the sign of OMO gets negative.

Rearranging equation (2) to get OMO on the left-hand side and substituting it into (1) yields:

$$Z = (i_C - i_R)\mathbb{C} + (i_R - i_D)\mathbb{D} + (i_M - i_R)r\mathbb{D} - CC - VC(\mathbb{C}, Y) \tag{3}$$

The above formula provides an interesting breakdown of the commercial banks profit. It consists of four components: the revenues on lending activity $(i_C - i_R)\mathbb{C}$, the revenues on deposit collection $(i_R - i_D)\mathbb{D}$, revenues stemming from the required reserves system $(i_M - i_R)r\mathbb{D}$ – these are usually negative or zero, and the costs CC and VC.

Commercial banks, like any other firms, operate to maximize profits. So the interest rates on credits are also set on such a level that guarantees the maximization of profits. The non-bank entities credit demand curve is usually expressed as:

$$\mathbb{C} = Y^{\alpha} e^{-\beta i_C} c. \tag{4}$$

So to find the interest rates maximizing the profits a following problem must be solved:

$$\begin{array}{rrcl} \text{Max} & Z(i_C, \mathbb{C}) & = & (i_C - i_R)\mathbb{C} + (i_R - i_D)\mathbb{D} + (i_M - i_R)r\mathbb{D} - CC - VC(\mathbb{C}, Y) \\ \text{st.:} & \mathbb{C} & = & Y^{\alpha} e^{-\beta i_C} c \end{array} \tag{5}$$

Substituting the condition into the profit equation yields

$$Z(i_C) = (i_C - i_R)Y^{\alpha} e^{-\beta i_C} c + (i_R - i_D)\mathbb{D} + (i_M - i_R)r\mathbb{D} - CC - VC(Y^{\alpha} e^{-\beta i_C} c, Y), \tag{6}$$

where the profit Z depends on i_C only. So the FOC is simply $\frac{\partial Z}{\partial i_C} = 0$, which gives:

$$\frac{\partial Z(i_C)}{\partial i_C} = Y^{\alpha} e^{-\beta i_C} c(1 - \beta(i_C - i_R)) + \beta Y^{\alpha} e^{-\beta i_C} c \frac{\partial VC(Y^{\alpha} e^{-\beta i_C} c, Y)}{\partial (Y^{\alpha} e^{-\beta i_C} c)} = 0 \tag{7}$$

and after rearranging:

$$i_C - \frac{\partial VC(Y^{\alpha} e^{-\beta i_C} c, Y)}{\partial (Y^{\alpha} e^{-\beta i_C} c)} = i_R + \frac{1}{\beta}. \tag{8}$$

To obtain (8) an assumption was made that the volume of deposits is not dependant on the amount of credit granted and thus also on the credit interest rate i_C. This may not necessarily be true from the entire banking system point of view, because the credits are transformed into deposits by the credit takers (less the cash in circulation leakage, which is usually not very high). But a particular bank cannot be sure that the money he lends will be deposited by the creditor with him, so it is reasonable not to assume it. Here, the entire banking system equation was obtained as an aggregation of the profit-maximizing behaviours of particular banks. Therefore the deposits $\mathbb{D}$ in equation (6) do not depend on i_C.

Looking at the entire banking sector through equation (8) one can ask a question what would be the price of credit if the sector behave like a mononopoly, i.e. the aggregated banking sector would act as an individual bank. In such a hypothetical situation banks could pose a much higher premium than they actually do. The actual premium is lower due to competition in the banking market. This makes banks operate suboptimally from a monopoly point of view.

The resulting equation (8) indicates that the level of retail interest rates should exceed the interest rates on the interbank market. The spread is dependant on the changes in variable costs VC, so for instance when the default risk increases it is justified to expect a rise in the credit rates. The level of credit interest rates depends also on the elasticity β of the credit demand with respect to credit prices, i.e. the credit interest rates. The lower the interest rate elasticity of the demand, the higher the spread the banks put. This phenomenon will be explored in the next section to define a measure of the competitiveness of the credit market.

2 Quantifying market competitiveness

According to standard microeconomic theory, firms are price takers in purely competitive markets, ie. they do not have any market power to influence the price of goods they sell. If they attempt to set the price above the market price, they do not sell anything. The less competitive market, the more price-setting power can be exercised by firms.

A slope of demand curve can be used to assess the competitive structure of a market. Usually the slope is determined by the price elasticity of demand. Virtually two price elasticities of demand can be identified. The first one is the price elasticity of aggregated demand; denote it with β^T. The second one, β^P, is the price elasticity of the demand for goods sold by a particular firm. Take for instance a paper market in a country. Then β^T is the elasticity of total demand for paper from all the paper users in the country with respect to the general price of paper. It is indifferent to a particular paper supplier, but it takes into account the prices coming from all the suppliers in the market. In contrast, β^P is the price elasticity of demand for paper produced by a particular firm; it represents the sensitivity to prices that this particular firm observes when selling the paper produced by itself.

In a low-competition market, where firms can influence the prices, they observe their own price elasticity being close to the price elasticity of the aggregated demand. Hence β^P is not much different from β^T. When the market is more competitive, firms lose their power to influence the prices. When they attempt to raise their price, the clients flee away to other suppliers and the demand falls sharply. On the other hand lowering price attracts many clients from the competitors and hence the demand soars. So the firm's own price elasticity of demand exceeds that of the aggregated demand, $\beta^P > \beta^T$. In retail credit market the firms supplying goods are commercial

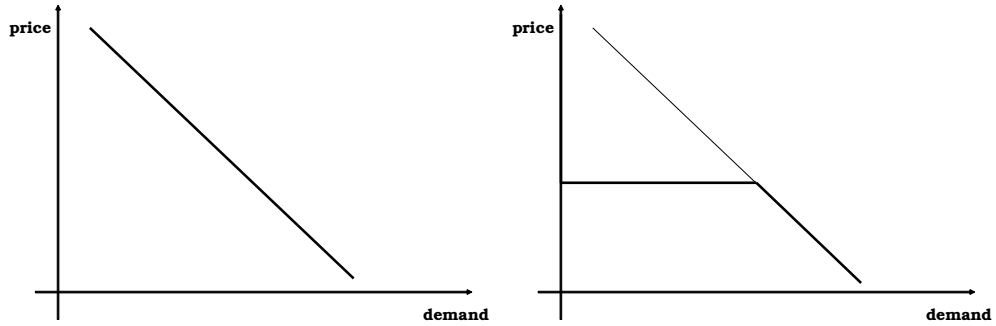

Figure 1: Demand curves. A monopoly's demand is the market demand (left), in case of pure competition a supplier's demand curve diverges from the market demand (folded line at right)

banks selling credits, and the demand side comprises of non-financial corporates and households buying the credits. The price is the interest rate paid on credits. Figure 1 presents example demand curves in case of monopoly and pure competition.

To quantify the degree of competitiveness of credit market the above-sketched methodology can be applied. First, use the aggregated credit demand function in order to determine β^T:

$$\mathbb{C} = Y^{\alpha} e^{-\beta i_C} c \tag{9}$$

The notation strictly follows that of previous section. Put $\beta^T = \beta$. Next, apply the results of Section 1 (equation (8)) to compute β^P:

$$i_C - \frac{\partial VC(Y^{\alpha} e^{-\beta i_C} c, Y)}{\partial (Y^{\alpha} e^{-\beta i_C} c)} = i_R + \frac{1}{\beta}. \tag{10}$$

Put $\beta^P = \beta$. Again, the notation remains unchanged. In such a framework a degree of competitiveness Ψ of the credit market can be for instance defined as

$$\Psi = \frac{1}{\beta^T} - \frac{1}{\beta^P} \tag{11}$$

This definition implies that the higher Ψ, the more competitive the credit market.

3 Consumer credit market competitiveness versus interest rate transmission

As already mentioned, the research on monetary transmission mechanism identifies a number of factors that may contribute to the decrease in the speed and precision of the pass-through from the central-bank controlled money market interest rates to the retail credit interest rates. One of those factors is the degree of competition in the retail banking market. This section presents an attempt to identify a relation between the competitiveness and the interest rate transmission mechanism. The methodology presented above is applied to assess the competitiveness of the consumer credit markets in Czech Republic, Hungary, eurozone and Poland. Next, some results for transmission of the short term money market rates controlled by the central banks to the

interest rates demanded by commercial banks on consumer credits are presented – a methodology similar to that of Chmielewski [9] or de Bondt [3] was applied. Finally, a comparison of the degree of competition in the four markets with the interest rate pass-through is performed. This enables to draw some conclusions regarding the impact of the credit market competitiveness on the interest rate channel, the degree of consistency among the consumer credit markets and the convergence of interest rate transmission mechanisms in the three new EU-member states and the eurozone.

3.1 Competitiveness of the consumer credit markets

To assess the competitiveness of the consumer credit markets in Czech Republic, eurozone, Hungary and Poland the Ψ concept proposed in the previous section was applied. First, the price elasticities of the aggregate consumer credit demand were computed for all the four economies[1]. A following specification of the long-run credit demand was estimated:

$$\ln(\mathbb{C}) = c_1 + c_2 \ln(Y) + c_3 i_C \tag{12}$$

where $\mathbb{C}$ is the CPI-deflated stock of consumer loans granted by the commercial banks to households, Y is the index of Gross Domestic Product in constant prices and i_C denotes the average interest rate on consumer loans in commercial banks. Figures 2-4 below plot all the relevant series for the countries under analysis. The following data sources were used: central banks' web sites for the credit volumes, the interest rates on consumer credits and the GDP for euro area, IFS database for the Czech and Hungarian GDP and Polish Central Statistical Office (GUS) for Polish GDP. The GDP and credit volume series were seasonally adjusted with the X11 ARIMA methodology. Quarterly frequency data was used. All series were tested for stationarity; the results of unit-root test confirmed that all are first-order integrated. Because of significant structural changes in the Polish credit market stemming from tax code modifications starting in early 2002, a dummy was added to the specifiacation (12) to control for the phenomenon[2]. Table 1 summarizes the estimates of c_2 and c_3 in equation (12); c_1's are not presented as these are just the intercepts and as such do not have any valuable economic meaning in this case. The estimation periods start at 1996Q4, 1997Q4, 1997Q1 and 1998Q1 for Poland, eurozone, Czech Republic and Hungary respectively and end in the mid-2003.

The main criterion used to verify the estimation results was the stationarity of residuals of the estimated equations. The ADF-tests were performed, proving that the residuals were stationary in case of all the four countries (see Table 2). Thus one can consider the results presented in the table 1 as the approximation of the long-run consumer credit demand.

[1]The estimates of credit demand elasticities applying the demand-side equation only and based on actual figures may prove imprecise as the "market outcome" may be influenced by supply-side factors as well, such as for instance credit rationing. However, this study does not attempt to identify the exact price elasticities. Here it suffices to know the rough value of the elasticities to assess the relationship between degree of competition and the slugishness of interest rate pass-through.

[2]From 2002 on the taxation rules on housing market were subject to frequent changes in Poland. The general trend was to increase the tax burden. This gave the households incentive to build more and faster before the advertised new tax regulations are binding. In consequence, the volume of housing credits grew substantially, crowding out the credits for consumption. This phenomenon is believed to be temporary, although its duration may be not very short.

		c_2 income elasticity of credit demand	c_3 price elasticity of credit demand
Czech Republic	point estimate	3.81	-6.15
	1 std bandwidth	0.80	1.73
eurozone	point estimate	1.85	-2.65
	1 std bandwidth	0.14	1.4
Hungary	point estimate	6.13	-0.56
	1 std bandwidth	0.34	1.39
Poland	point estimate	3.78	-0.66
	1 std bandwidth	0.33	0.69

Table 1: Estimation results of equation (12)

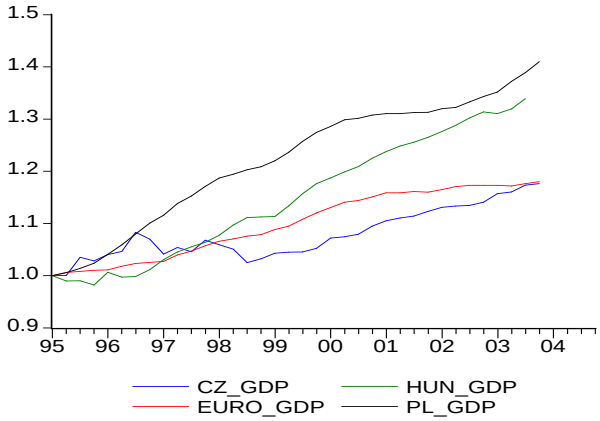

Figure 2: GDP indices – constant prices, seasonally adjusted.
Source of data: IFS database for Hungary and Czech Republic, GUS Polish Cenral Statistical Office for Poland, ECB Bulletin for eurozone

Income elasticities c_2 for Czech Republic, Poland and Hungary have been found to significantly exceed the value of unity suggested by theory. This is due to the faster credit growth in relation to the economic growth observed in the transition countries in Central and Eastern Europe. The process of closing up the consumption gap and also the credit gap that were widely opened in

	ADF statistics	p-value
Czech Republic	-2.86	significant at 0.05-level
eurozone	-1.94	0.0517
Hungary	-2.94	significant at 0.05-level
Poland	-3.29	significant at 0.05-level

Table 2: Stationarity tests of the residuals from equation (12)

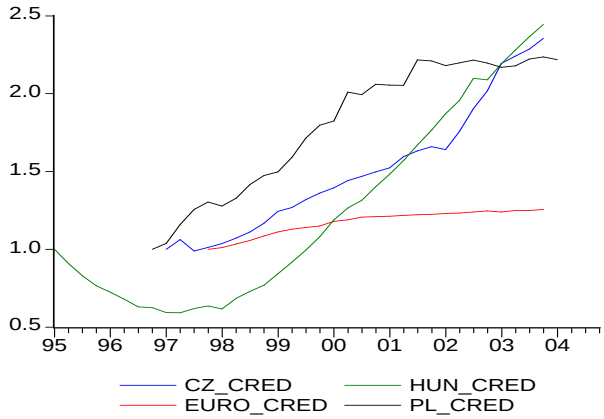

Figure 3: Consumer credit – constant price indices, CPI-deflated, seasonally adjusted.
Source of data: National Central Banks; data for Hungary: financial accounts of households; euro-zone: MFI loans; Poland: assets and liabilities of monetary financial institutions; Czech Republic: ARAD database, consumer loans + overdraft facilities and debit balances on current accounts, adjusted with the monthly rate of change figures.

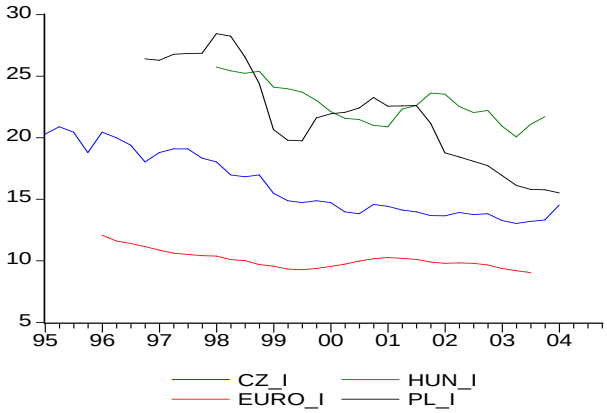

Figure 4: Nominal interest rates on consumer credits.
Source of data: National Central Banks; Czech data for the period before 2002 estimated with the use of the monthly rate of change of the interest rate on total credits to households; Hungarian: series for three periods merged: pre-2000, 2000-2002, and post 2003.

the pre-1990 period was forwarding quickly over the course of nineties and has not probably been completed yet.

The coefficient c_3 corresponds to β in equation (9). Considerably wide one standard deviation bands suggest that the point estimates of the credit demand price elasticity c_3 may not be very precise. The specifications probably lack some variables explaining the developments of the credit activity. However as determining the best specification for the credit demand equations is beyond the scope of this paper and as it is sufficient for the study to specify a rough value of the price elasticities, the estimates obtained have been accepted for further use.

The results presented above refer to the aggregated credit demand price elasticity. Next an attempt to quantify the credit demand price elasticity from the banks' point of view was made

	Consumer credit interest rate i_C	Money market interest rate i_R	Spread $i_C - i_R$
Czech Republic	13.26	2.05	11.22
Eurozone	9.13	2.29	6.84
Hungary	21.4	10.3	11.1
Poland	15.79	5.37	10.42

Table 3: Interest rates on consumer credits i_C, money market interest rates i_R and the spreads $i_C - i_R$: average values for the second half of 2003 for Czech Republic, Hungary and Poland, average values for the period Apr2003 - Sept2003 for eurozone. Money market rates used: PRIBOR 1M, EURIBOR 2W, BUBOR 1M and WIBOR 1M. Data in percentage points.

with the use of equation (10). Rearranging the terms in this equation yields the following formula for Ψ:

$$\Psi = \frac{1}{\beta^T} - \frac{1}{\beta^P} = \frac{1}{\beta^T} - (i_C - i_R) + \frac{\partial(VC)}{\partial(\mathbb{C})} \tag{13}$$

To effectively compute Ψ one needs to know the spread of consumer credits interest rates over the money market interest rates. Table 3 presents data on i_C, i_R and the spread $i_C - i_R$ for the second half of 2003.

A precise quantification of the last term in the expression (13), ie. $\partial(VC)/\partial(\mathbb{C})$ is not an easy task, especially because it depends on many factors such as for instance the prospects for economic growth, unemployment rate, default risk or the non performing loans ratio in the commercial banks' portfolios of credits granted to households. Out of all the four countries under investigation the unemployment rate is the highest in Poland (19.6% in 2003Q4). Czech Republic goes next with 10% (2003Q3), Hungary and eurozone record lower figures: 8.1% (2003Q4) and 8.8% (2003Q3) respectively. The NPL figures are also the worst for Poland, where the NPL share stays at about 20%. Czech Republic performs better with the NPL share of 9.5% in 2002 [17]. The situation is again relatively the best in Hungary and eurozone, where the NPL shares stay below 5%. Combining those data with the economic growth prospects justifies a following order:

$$\frac{\partial(VC^{PL})}{\partial\mathbb{C}} > \frac{\partial(VC^{CZ})}{\partial\mathbb{C}} > \frac{\partial(VC^{HUN})}{\partial\mathbb{C}} > \frac{\partial(VC^{EUR})}{\partial\mathbb{C}} \tag{14}$$

Substituting the estimates gathered in the table 1 and 3 into the equation (13) yields the degrees of competitiveness for all the four countries, which are presented in table 4. Hungary and Poland have Ψ higher than eurozone and Czech Republic. It is hard to decide in which one of the two – Poland or Hungary – Ψ is higher, because one doesn't know the exact numerical value of the $\partial(VC^{PL})/\partial(\mathbb{C})$ and $\partial(VC^{HUN})/\partial(\mathbb{C})$. Keeping in mind that $\partial(VC^{PL})/\partial(\mathbb{C}) > \partial(VC^{HUN})/\partial(\mathbb{C})$, a statement that the competitiveness in the consumer credit market is similarly high in both countries seems not to be far from truth. The eurozone case remains in between Hungary/Poland and Czech Republic. Czech Republic has Ψ at the lowest level. It is so even though $\partial(VC^{CZ})/\partial(\mathbb{C}) > \partial(VC^{EUR})/\partial(\mathbb{C})$. Should one want to transform the Czech case to achieve the eurozone's level of Ψ, the increase of $\partial(VC^{CZ})/\partial(\mathbb{C})$ by at least 0.25 would be necessary. But $\partial(VC^{CZ})/\partial(\mathbb{C})$ cannot exceed 0.112 for it would mean that granting credits generates losses for the commercial banks when $\partial(VC^{CZ})/\partial(\mathbb{C}) > 0.112$. More, assuming (14) holds, it has even to be lower than

0.1042, the Polish border value. So finally the Czech case can be labelled a low-competitiveness case, and the eurozone – a moderate-competitiveness case.

	Ψ	competitiveness of of consumer credit market
Czech Republic	$\frac{1}{6.15} - 0.1122 + \frac{\partial(VC^{CZ})}{\partial(Cr)} = 0.051 + \frac{\partial(VC^{CZ})}{\partial(Cr)}$	low
eurozone	$\frac{1}{2.65} - 0.0684 + \frac{\partial(VC^{EUR})}{\partial(Cr)} = 0.309 + \frac{\partial(VC^{EUR})}{\partial(Cr)}$	moderate
Hungary	$\frac{1}{0.56} - 0.111 + \frac{\partial(VC^{HUN})}{\partial(Cr)} = 1.675 + \frac{\partial(VC^{HUN})}{\partial(Cr)}$	high
Poland	$\frac{1}{0.66} - 0.1042 + \frac{\partial(VC^{PL})}{\partial(Cr)} = 1.411 + \frac{\partial(VC^{PL})}{\partial(Cr)}$	high

Table 4: Estimates of Ψ

3.2 Transmission from money market rates to consumer credit rates

Retail interest rates demanded by commercial banks on consumer credits granted to households do follow the path of the money market interest rates, however the developments of the two usually are not perfectly parallel. Commercial banks are often quite sluggish to automatically adjust the retail rates to the changes in the money market rates. To analyze the speed of adjustment of the commercial credits interest rates in the four countries of interest, an ECM approach similar to that proposed by de Bondt [3], Winker [25] or Chmielewski [10] was applied. First, a long run relationship between consumer credit interest rates and money market rates was estimated:

$$i_{C,t} = \kappa + \gamma i_{R,t}, \tag{15}$$

where t denotes a time subscript. Next, an error correction short term equation was built:

$$\Delta i_{C,t} = c + \alpha \Delta i_{R,t} + \delta(i_{C,t-1} - \kappa - \gamma i_{R,t-1}) + \epsilon_t \tag{16}$$

Both equations (15) and (16) for each of the four economies were estimated with OLS techniques. The stationarity of equation (15) residuals was tested with ADF. The results confirmed the residuals to be I(0) for all the countries. When the δ coefficient in equation (16) turned out to be negative and significantly different from zero, the specification was accepted as a correct ECM model. For the sake of better statistical properties, in the case of eurozone data a less parsimonious specification was applied, ie. two lagged i_R differences were included into equation (16), $\Delta i_{R,t-1}$ and $\Delta i_{R,t-2}$. The span of data used for estimations covered was: 1999M1-2003M9 for eurozone, 1998M1-2004M4 for Hungary, 1997M1-2004M4 for Poland and 1996Q1-2004Q1 for Czech republic. Table 5 presents the coefficient estimates.

The results for γ coefficients are generally low, indicating that no complete pass-through takes place in any of the four countries. At first glance this seems unexpected. However, the analysis is performed for the household consumer credit sector, where the banks are virtually the only source of refinancing. Other research papers also report the lowest values of γ parameters in this particular segment of credit market, like for instance de Bondt or Chmielewski, mentioned already.

	γ	α	δ	90% adjustment time
Czech Republic	0.42	0.23	-0.055	28 quarters after shock, or virtually infinite
eurozone	0.43	0.23 on $\Delta i_{R,t-1}$ 0.14 on $\Delta i_{R,t-2}$	-0.15	11 months
Hungary	0.36	0.15	-0.23	8 months
Poland	0.59	0.34	-0.15	10 moths

Table 5: Interest rate pass-through model – estimation results

3.3 Relationship between competitiveness and interest rate transmission

The above-presented findings with regard to the assessment of the consumer credit market competitiveness and interest rate pass-through in Czech Republic, Poland, Hungary and eurozone point to the existence of a relationship between the two. The combination of the results presented in table 6 indicates that the competitiveness may have an impact on the transmission mechanism of the interest rates. In Poland and Hungary, where the consumer credit markets are competitive in terms of Ψ, the pass-through is reasonably quick. Contrary to this, the Czech Republic where the competition among the banks selling consumer loans is low demonstrates also a considerably sluggish interest rate pass-through.

	credit market competitiveness	interest rate pass-through
Czech Republic	low	slower than in eurozone
eurozone	moderate	
Hungary	high	comparable to eurozone
Poland	high	comparable to eurozone

Table 6: Consumer credit market competitiveness vs. interest rate pass-through

It is worth to note that the interest rates pass-through results are similar for Poland, Hungary and eurozone, whereas the competitiveness measures differ. The markets in the two new EU-participant countries are more competitive than that of the eurozone. The interest pass-through mechanism is a resultant of many factors influencing it. Since it seems similar in the three economies at least in terms of the 90% adjustment time, and the competitiveness differs, also the other factors must differ. Identifying which are those factors – maturity of the market, its concentration, ownership structure, fiscal burdens, other – may be very interesting, but is out of the scope of this research. In the case of Czech Republic the differences are even more pronounced, since not only the competitiveness but also the interest rate pass-through pattern diverges from what is observed in the neighbourhood. So there is probably still some time needed for the consumer credit interest rates monetary transmission channels in Poland, Czech Republic and Hungary to converge to the aggregate eurozone patterns. When converging, the countries will approach the eurozone attractor from different directions. In this context another question arises as to the interconvergence among the present eurozone participants. To investigate this one needs a complete set of data for all those countries, which unfortunately is hardly available.

4 Conclusions

The paper looks into the relationship between the degree of competition in consumer credit market and the interest rates transmission efficiency. A quantitative measure of competitiveness is proposed, based on the difference of the interest rate elasticities of the aggregated credit demand and the demand for credits granted by particular banks. Applying this measure an assessment was made of the competitiveness of consumer credit markets in Poland, Czech Republic, Hungary and eurozone. The results indicate low competition in Czech Republic, moderate in eurozone and relatively high in Hungary in Poland. Thus the heterogeneity of the consumer credit markets was confirmed in the three new EU-member states and eurozone. Next, the adjustment mechanism of the consumer credits interests rates to the changes of the central bank controlled interest rates was examined. The findings point out that the sluggishness and inaccuracy of the adjustments may be related to the degree of competitiveness of the consumer credit markets. The less competitive the market, the slower the consumer rates reaction to the money market moves.

The discrepancies in interest rate transmission channels in current common currency area participants and the new EU entrants, who plan to join eurozone in near future, should attract the attention of the monetary policy authorities in these countries. In present circumstances, the impact of the policy decisions made in Frankfurt on the consumer credit markets would differ across those countries. If the competition patterns and interest transmission were to converge, Czech Republic, Poland and Hungary would approach eurozone from different directions.

Looking at the findings a question arises about the degree of convergence of the transmission mechanism in the present eurozone member states. The answer is however beyond the scope of this paper.

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