

Doctoral (PhD) Thesis Summary

**THE EFFECTS OF COMMON CURRENCY AND INTERNATIONAL
FINANCIAL INTEGRATION ON THE MONETARY TRANSMISSION
MECHANISM**

Bálint HERCZEG

Supervisor: Prof. Julius HORVATH



UNIVERSITY OF DEBRECEN
Doctoral School of Economics
PhD program 'Competitiveness, Globalization and Regionalism'

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„Setting a single interest rate for 12 countries has been hard enough, even with low inflation. Choosing one for a much more mixed bag of 20-odd may be impossible” The Economist [2003] p. 16.¹

1. Introduction and research history

In 2003 as a bachelor student at the University of Debrecen, I was reading The Economist in the library and found an article in the editorials about the challenges - the freshly appointed president of the European Central Bank - would face. The sentence cited above made me curious: how would the central bank set its interest rate for so many different countries? It didn't take much reading to find the answer: the ECB defined the Harmonized Index of Consumer Prices (HICP) and sets its interest rate in accordance with the inflation measured using this price index. But an interest rate set by monetary policy relying on an average change in prices can't guarantee price stability in all the member countries. If the member countries are different then they should respond differently to the same monetary shock. Thus the problem still puzzled me. As a consequence I wrote my master thesis about the differences between the Hungarian households' balance sheet and the balance sheet of households in the euro area. In my thesis I tried to describe, how these differences would affect the transmission of the monetary policy. In 2005, by the time I had to choose a theme for my dissertation, I already knew what I would be interested in: differences in the monetary transmission channels.

If one reads about the European Monetary Union it wouldn't take much time to encounter the optimal currency area literature (the fact that my supervisor previously researched this theme definitely accelerated this process). In the optimal currency area literature the possibility of endogeneity thrilled me.² This made my research topic of differences in the monetary transmission mechanism even more interesting. Thus not only could there be differences in the transmission mechanism, but these differences would react to the introduction of the common currency.

Originally the effect of increased international integration of financial markets on monetary policy transmission was a separate research project. However, later it developed to serve as a probable alternative explanation next to the introduction of common currency for the changes found in the transmission mechanisms.

¹ This was the way of editors of The Economist wished good luck to the new president of the European Central Bank, Jean-Claude Trichet at fall of 2003.

² I thank Dóra Györffy for this idea.

The research of the changes in the transmission mechanism due to the accumulation of the foreign exchange denominated debt is a direct descendant from my master thesis. It also started as separate project and I spent the summer in 2008 at the Magyar Nemzeti Bank as a visitor researcher to develop the idea. Later this paper also found its place in the dissertation as a case study for international integration.

All these ideas and subsequent research I had done, as described above, have one thing in common, i.e. the research question of this dissertation: **How do major changes in the monetary policy's (technological, policy etc.) environment change the transmission of the monetary policy?**

There are several reasons why this research question might be an interesting one. First, the transmission of the monetary policy lies at the hearth of monetary macroeconomics. The questions arising from the investigation of the transmission are the most important questions of this discipline: the interaction between nominal and real variables; the frictions causing the monetary policy having real effects; the overwhelming role of expectations; the causes of business cycle movements etc. Second, the monetary transmission process is a very complex system, as I try show later, the transmission comprises of several steps, more than dozen different channels, all in interaction with each other. In addition, many structural variables, institutional arrangements, historical events influence the transmission mechanism. The transmission mechanism is always hit by different shocks, it is always changing, developing. So to find out how changes in the policy environment would affect separate channels or the whole mechanism, is not only an intellectual challenge, but also a methodological one. The third motivation could be the practical consequences of this research. The better knowledge of the transmission of monetary policy is welcomed by the policymakers, as it might help to calculate the consequences of their decisions.

2. Transmission of monetary policy and methodology used in the dissertation

Chapter 2 is dedicated to theoretical and methodological questions. First the transmission mechanism is introduced. Selective review is given about the most important questions of monetary decision making, covering themes as: credibility, accountability, nominal anchor, communication etc. In the next step a small model is shown to explain the basic mechanism behind interest rate pass-through, the connection between the short term interest rate used as policy instrument and the credit rates set by

the banks. Next, different channels of transmission are introduced, all transmitting the shock from the financial sector towards the inflation rate.

The transmission of a monetary policy decision could be summarized as follows:

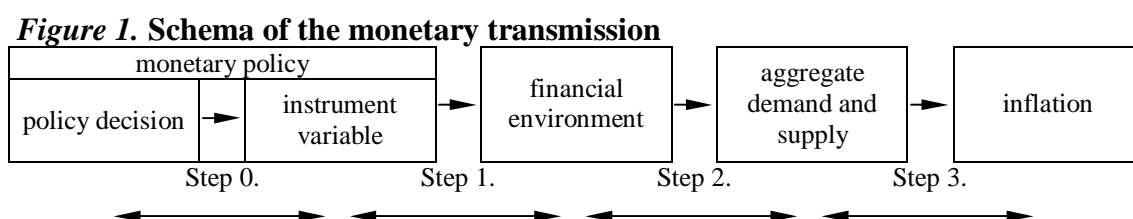
Step 0. The decision making body sets the value of the instrument according to its aim. In an inflation targeting framework this would mean that if the forecasted inflation is higher than the aim, the board would increase the interest rate.

Step 1. The instrument variable is changing the prices and liquidity of the other assets in the financial system (partially through direct channels and partially through effecting expectations of the economic agents).

Step 2. The changes in the financial environment influence the decisions and choices of the household and the business sector – so it influences aggregate demand and supply.

Step 3. The altered aggregate demand and supply affects the inflation dynamics

The schema describing these relationships is shown in *Figure 1*:



The second part of Chapter 2 is devoted to methodological questions. As already mentioned pinning down the consequence of a change in the policy environment given a complex system, is not an easy task. I use different types of vector autoregressive models throughout the dissertation. The methods used in the dissertation are: split samples and simple non-linear vector autoregressive models.

3. Results

To answer the research question, two major changes in the monetary policy's environment were chosen. The first is the increased international integration of financial markets, the second the introduction of the common currency in the member countries of the European Monetary Union. This complicates the matters at hand because the two events happened almost at the same time and some of their effects coincide.

3.1 Effects of financial integration

Chapter 3 is dedicated to the changes caused by the increased financial integration. Financial integration denotes the process led by a new technological environment (the spread of the internet, decreased communication costs) and as a consequence of which, goods, labour and financial markets are becoming increasingly integrated globally.

Detailed literature survey is used to form a hypothesis about the effects of the globalisation on the monetary policy. This hypothesis is tested in two case studies. The first is the case of the United Kingdom. The second case study tries to measure if the foreign currency denominated debt accumulated by the Hungarian household changes the Hungarian monetary policy's main transmission channel, the exchange rate channel.

3.1.1. Changes of overall monetary transmission due to international financial integration

The integration of financial markets enhances the element of unpredictability in the monetary transmission process. According to *Sukudhew et al.* [2008] and *Gudmundsson* [2008] the pass-through into short run interest rate should be stronger (the reaction of interest rates are more immediate and proportionally greater) in financially developed countries, with greater competitiveness in the financial system (see also *Mojon* [2000]) and deeper intermediation. On the other hand as *Gudmundsson* [2008] documents, in small open economies the long-term interest rate is more determined by global factors, and even in the USA the long-term interest rate does not react to changes in the short-term interest rate in the same way as it used to.³ The response of aggregate demand to changes in the financial environment (changes in interest rates, stock prices and credit availability) is altered mainly by the changes in the financial portfolios of households. On the one hand financial integration made possible increased household indebtedness; on the other hand it also causes more volatile asset prices (*Wagner and Berger* [2003], *Rogoff* [2006]). These two added together result in an uncertain reaction on the part of households - a reaction which depends to an extent on how the volatile asset price is perceived by the households. Finally, there is an ongoing debate about the causes of changes in the relation of inflation to the domestic output gap. There is some evidence that the flatter Phillips curve might be caused by international financial integration (as

³ This phenomenon is known as 'conundrum' as labeled by former Federal Reserve Chairman Alan Greenspan (see *Boivin and Giannoni* [2008])

shown by *Borio and Filardo* [2007], *Chmielewski and Kot* [2006], and *IMF* [2006]), an assertion disputed by others (*Yellen* [2006], *Kohn* [2006], *Ihrig et al.* [2007]).

1. thesis International financial integration made the transmission mechanism even more unpredictable then before, forcing the monetary policy to make slower and more cautious steps toward its goal.

3.1.2. Changes in the channels of monetary transmission due to international financial integration

Through the interest rate channel monetary policy can influence the opportunity cost as well as the user cost of capital and thus investments and consumption. The interest rate channel should be strengthened by liberalisation and especially by interest rate deregulation. This encourages the banks to move from quantity to price determination, making clients react to prices. Disintermediation could also strengthen the reaction of aggregate demand, if the non-financial agents hold more interest-sensitive assets on their balance sheets (*Sukudhew et al.* [2008]).

According to *Mylonas et al.* [2000] and *Sukudhew et al.* [2008] the increase in financial assets caused by financial integration will strengthen the agents' reaction to a revaluation of assets, so increasing the weight of the wealth channels. However, this might make the reaction slower as well, because the revaluation of some wealth items (especially housing) takes a longer time and lengthens the response of households.

The consolidation of the financial system increased the size of the average bank, and financial innovations made it possible to lend without having assets on the books, so the importance of the common bank lending channel decreased. The development and integration of the capital markets makes alternative funding for companies available. In addition the technical developments made, to a certain extent, asymmetric information problems easier to solve, which according to the explanation provided by *Mishkin and Strahan* [1999] makes the collateral less important and the balance sheet channel weaker. Both of these components weakened the significance of the whole credit channel and also the financial acceleration should decline.

The exchange rate is one of the economy's most important relative prices and tools of adjustment which connects an economy with other countries. A deeper global

integration of different economies and markets should make this tool more important, and thus also the importance of the exchange rate channel might be expected to increase. Despite this effect the working of the exchange rate channel is not clear, because integration also makes it possible for companies and households to hold liabilities denominated in foreign exchange, which makes the wealth and income effect of the monetary policy weaker or in extreme cases even reverses it.

The expectation channel is partly endogenous because beyond a credible commitment to price stability, the ability of monetary policy to influence the economy, output and inflation is essential for forming expectations, so it depends on the other channels as well. A consequence of the flatter Phillips curve is that the inflation rate reacts less intensely to the shocks of demand (or policy errors), but at the same time this also means that policy makers cannot influence the price dynamics easily through demand channels. This makes credibility and the anchoring of expectations a more important channel (*Bundesbank [2006], Yellen [2006], Kohn [2006]*).

Looking at the channels of monetary transmission one can group the hypothetical effects based on whether they made the transmission of monetary policy stronger or weaker, or whether the variables react more quickly or need more time (*Table 1*).

Table 1. How the expected changes in the channels of transmission might influence the speed and strength of the whole monetary transmission process

Changes of different channels make the MTM's	
stronger	weaker
- interest rate channel (<i>Sukudhew et al. [2008]</i>)	- bank lending channel (<i>Bernanke [2007]</i>)
- exchange rate channel (without foreign currency debt)	
- wealth channels (<i>Mylonas et al. [2000]</i>)	

2. thesis Relying on the literature the conclusion can be drawn that international financial integration weakened the broad credit channels, and strengthened the interest rate and the wealth channels. The effect on exchange rate is dubious, as it depends not only on trade integration but also on cumulation of foreign currency debt.

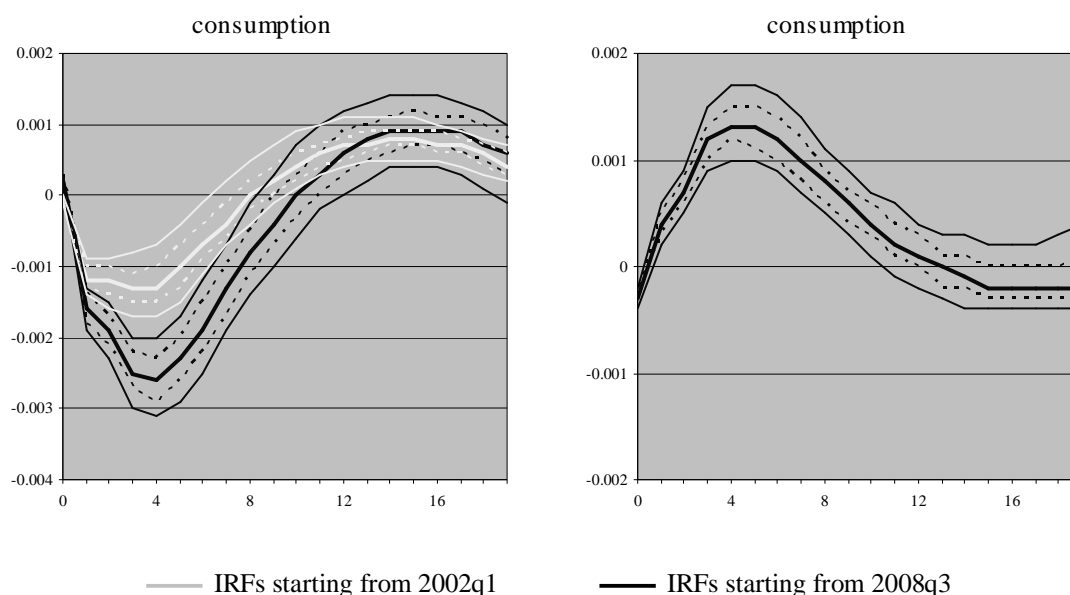
3.1.3. Did the possibilities granted by the increased financial integration affected the monetary transmission in the Hungary?

In section 3.2 a special effect of financial integration was investigated as a case study of Hungary. In this case the special effect is the possibility for households to accumulate debt in foreign currency. As the rapid foreign currency debt accumulation made households' consumption more sensitive to exchange rate depreciation, the hypothesis was that the exchange rate channel of monetary policy should be weakened or even inverted.

To be able to compare the transmission of monetary policy in case of low and high amount of foreign currency denominated debt, a non-linear VAR model was used to make the resulting impulse response functions conditional on the accumulated debt. This methodology made it possible to compare the reaction of the economy in two scenarios. In the first case the IRF-s were launched from 2002q1, when household foreign currency debt was still negligible, the second case is from 2008q3 where the ratio of household debt denominated in foreign currency reached 64% of households' liabilities. A further advantage of these two dates is that neither the exchange rate nor monetary policy regime changed significantly between these two points in time, keeping regime changes to the minimum.

The results show significant differences of the reaction of consumption in the presence of more foreign currency denominated debt in every scenario (*Figure 2*), but several counter-intuitive movements were found in the case of other variables, which makes the results less solid. On the other hand robustness checks showed that the result was not caused by specification problems, and remained robust under different specifications.

Figure 2. Reactions of consumption to a monetary policy shock and the difference of the reaction (2002q1 minus 2008q3)



Source: own calculation

Note: thin continuous lines represent 90%, dashed lines represent 60% confidence intervals from 10000 Monte Carlo simulations, based on Hamilton [1994] p. 337 as shown in Appendix 2A. The figures above are result from vector autoregression with exchange rate included, and additional exchange rate shocks to constrain the two exchange rate impulse responses to be the same.

3. thesis The accumulation of foreign currency debt changed the exchange rate channel of the monetary policy in Hungary.

3.2. Effects of common currency

In Chapter 4 I investigated the interaction between the common monetary policy of a currency area and the different transmission mechanisms in the member countries. The basic hypothesis was that the common monetary policy changed the financial environment and, through this, slowly make the effect of monetary policy more homogeneous among the member countries. The investigation was done in three steps, phrased in the following three propositions.

3.2.1. The homogeneity of the monetary transmission as a criterion of optimal currency areas

In section 4.1 I reasoned that the common monetary policy can be seen as a source of asymmetric shocks, if the monetary transmission mechanism differs across the member countries. If this was the case then the differences in transmission should be treated within the OCA literature, using the same processes for adjustment. Relying on this

result, the OCA literature was selected to serve as a framework for the investigation of transmission process inside the currency union. The advantage of phrasing the problem within the optimum area literature is that the concept of endogeneity could be introduced in relation to the interaction between the common monetary policy and the differences in the transmission process.

4. thesis The common monetary shocks can work as asymmetric shock, in case the monetary transmission differs across the member countries of the currency union.

3.2.2. Differences in the monetary transmission mechanism among the members of the EMU

As has been shown in subsection 4.2.1 there were structural differences before 1998 that could have caused the different channels of monetary policy transmission to pass on different impulses in different countries. *Guiso et al.* [2000] draw the conclusion that the experiments that are nearest to the ideal one (often the experiments with the models developed by central banks of the member countries) show the same result as the key variables method and point to noticeable differences in the transmission mechanism. According *Dornbusch et al.* [1998] small models are often subject to misspecification (see subsection 4.2.2 and 4.2.4), central banks' big macro models are not comparable (or too comparable), but it is helpful that these models incorporate local knowledge of the economy. These evidences lead to conclusion that there were differences between the countries that introduced the common currency, differences which affected the monetary transmission mechanism as well.

5. thesis Based on the reviewed literature using structural differences and big macro models the conclusion can be drawn that there were differences in the monetary transmission mechanism at the beginning of the third stage of the EMU.

3.2.3. Endogeneity of the monetary transmission mechanism

As a first step to answer the question of whether there is an ‘euro effect’ in monetary transmission I studied the structural changes caused by the introduction of the euro in section 4.3.

Results from the literature show that financial integration was further accelerated by the introduction of the euro. This increases the competition and makes reactions of interest rates and other asset prices more homogenous across countries. Other changes couldn't be linked to the homogenization of the monetary transmission across countries. The introduction of euro raised the trade among all the EU countries, but not disproportionately among the euro area member countries. At the same time the exchange rate pass-through decreased as prices of previously imported goods aren't exposed to changes of exchange rate any more. The structure of production hasn't (yet) reacted to the introduction of common currency. Neither did labour market, price flexibility and wealth portfolios.

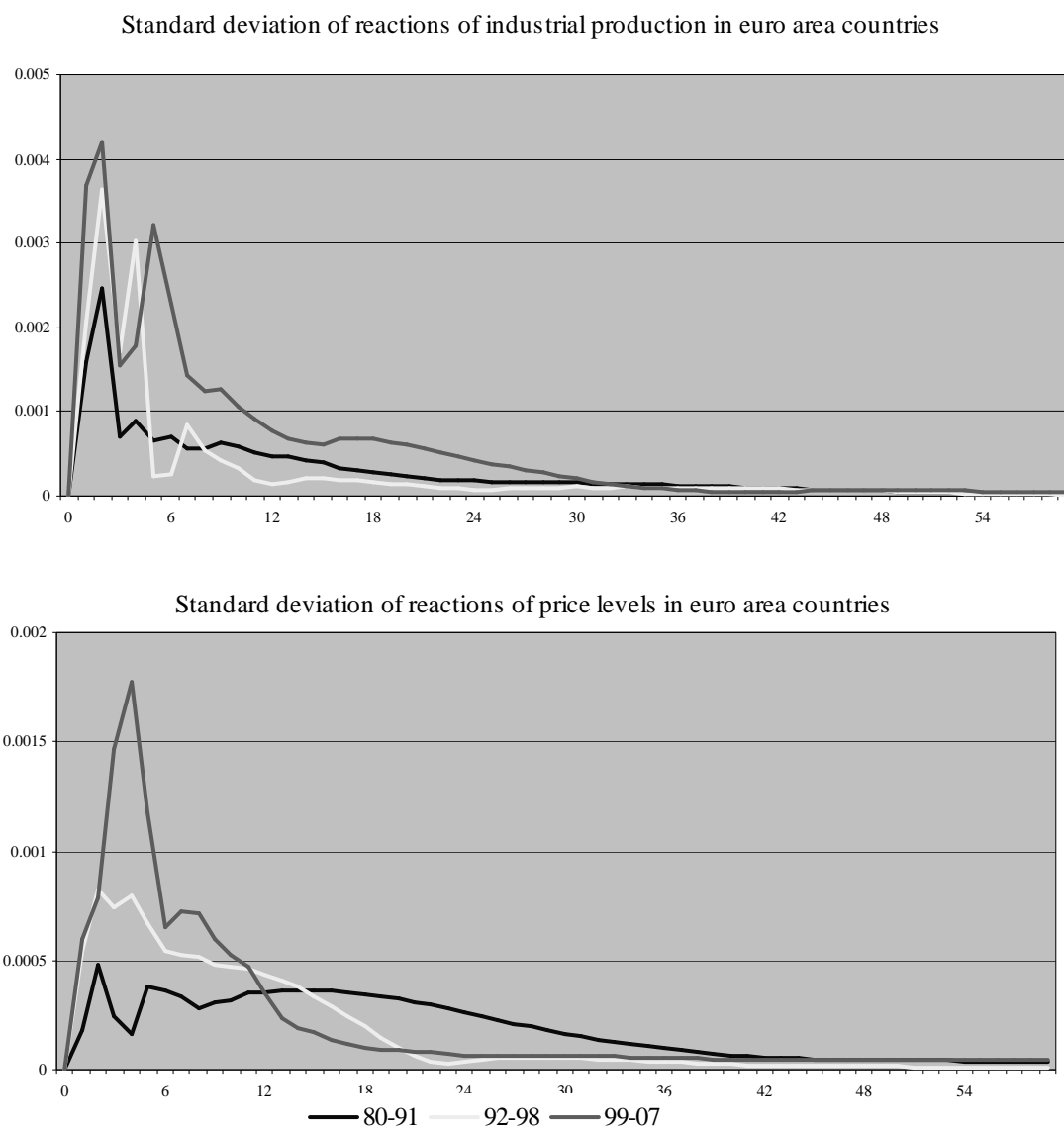
In section 4.4 I also tried to test empirically on the sample of France, Germany, Italy and Spain (and using the United Kingdom as control group) the hypothesis whether the European Monetary Union or the preparation for the third stage EMU endogenously changed the transmission of monetary policy in the participating countries. Using a vector autoregression methodology, I tried to simulate artificially the environment of the EMU in the previous samples. So in the pre-Maastricht (1980-1991) and the pre-EMU (1992-1998) samples, the German monetary shock was used as a common policy shock, the exchange rate and interest rate impulse responses of the countries are constrained to follow the impulse response of the leading ‘country’ (Germany in the first two samples and EMU in the last), and there are also spill over effects (from Germany in sub-sample 1980-1991 and 1992-1998, and from the euro area in sub-sample 1999-2007). After estimating models for each country, the standard deviation of the impulse response functions was used as a measure for heterogeneity in the reaction to the given shock. Some of the results are shown in *Figure 3*. For the industrial production the standard deviation is higher in the latest sample, and even converges slower to zero in the post-EMU sample. In case of price level there is however one small indicator pointing in the direction of convergence. Despite the fact that there is greater heterogeneity between the impulse responses in the post-EMU sample for the

first year than in either of the other samples, the standard deviation of IRFs in this group converge faster to zero than the other two. Relying on this measure I did not find any trace of convergence in the reaction of industrial production or price level, which means that the introduction of euro does not seem to have eliminated endogenously the differences in the monetary transmission mechanism.

My results here are in accordance with the result of *Ciccarelli and Rebucci* [2006], who found no change in the monetary transmission in the run-up to the EMU. On the other hand *Boivin et al.* [2008] find greater homogeneity of the transmission mechanism among countries of the Euro Area and also find that the monetary policy of the ECB has played a key role in this change.

6. thesis Relying on counterfactual vector autoregression models I found no evidence that the introduction of the common currency endogenously made the transmission of the monetary policy more homogenous across member countries.

Figure 3. Convergence in the reactions of industrial production and price levels



Source: own calculation

Note: the figures above show the standard deviation of the impulse response functions of France, Germany, Italy and Spain in different samples. To simulate the environment of the EMU (common shocks, integrated markets, fixed exchange rates) in the pre-Maastricht (1980-91) and the pre-EMU samples (1992-98), the German monetary shock is used as a common policy shock, the exchange rate and interest rate impulse responses of the countries are constrained to follow the impulse response of the leading 'country' (Germany in the first two samples, and EMU in the last), and there are also spill over effects (from Germany in sub-sample 1980-91 and 1992-98, and from the euro area in sub-sample 1999-2007).

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5. The author's publications and presentation in the matter of the thesis

Journal article:

HERCZEG, BÁLINT [2011]: Exchange rate pass-through estimated on KSH's store-level price quotas database. *Sigma* *forthcomming*

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Conference presentation:

Endogeneity of monetary transmission mechanism in the euro area *presented at International Workshop on Recent Issues in European Economic Integration and EU Enlargement, 23rd-24th June 2011, Brussels, Belgium*

The effect of globalisation on the transmission mechanism of the monetary policy: the case of the United Kingdom. *presented at Quantitative Methods in Economics 2010, 12th-13th November 2010. Cluj Napoca, Romania*

How does the Presence of Households' Foreign Currency Denominated Debt Influence the Transmission of Monetary Policy? *presented at 14th International Conference on Macroeconomic Analysis and International Finance, 27th-29th May 2010, Crete, Greece*

The Effect of the Households' Foreign Exchange Debt on the Monetary Transmission Mechanism in Hungary *presented at 1st Annual Conference of the MKE 19th-20th December 2007. Budapest, Hungary*

Notes:

