Economics Bulletin

Volume 33, Issue 2

Business lending rate pass-through in the Eurozone: monetary policy transmission before and after the financial crash

Christophe Blot
OFCE

Fabien Labondance
Université de La Réunion

Abstract

The aim of the paper is to understand how the financial crisis has affected the interest rate pass-through (PT) in the Eurozone between market rates and bank interest rates. We have applied a SUR-ECM model. This methodology allows testing for the homogeneity of the PT of the euro area countries. The main results of this investigation are the following. First, not surprisingly, we show that the financial turmoil since October 2008 has drastically affected the interest rate PT in the Eurozone. Second, the PT since the crisis is less complete than in the period previously studied. Third, nevertheless, it appears that the homogeneity between the Eurozone members has increased.

We would like to thank Eric Fisher for his suggestions.
Citation: Christophe Blot and Fabien Labondance, (2013) "Business lending rate pass-through in the Eurozone: monetary policy transmission before and after the financial crash", *Economics Bulletin*, Vol. 33 No. 2 pp. 973-985.
Contact: Christophe Blot - christophe.blot@ofce.sciences-po.fr, Fabien Labondance - labondance.fabien@gmail.com.
Submitted: July 11, 2012. **Published:** April 11, 2013.

1. Introduction

Banks play an important role in the transmission of monetary policy, especially in The European Monetary Union (EMU) where firms rely heavily on the banking systems to raise funds. This is an issue for the European Central Bank (ECB) since the transmission of monetary policy strongly hinges on the speed and size of the pass-through (PT) from policy-controlled interest rates to the national retail bank interest rates. This may also be a source of heterogeneity for the transmission of the common monetary policy, since, despite overall financial integration, credit markets are much less integrated in the euro area compared to stock, bond and money markets (see Jappelli and Pagano 2008). It follows that a differentiated transmission of monetary policy may contribute to asymmetric business cycles as it has been illustrated during the pre-crisis period. Indeed, Optimal currency area (OCA) theories emphasise the fact that monetary PT has to be relatively homogenous across economic regions that form a monetary area (see Mongelli 2005). This heterogeneity is supposed to remain pervasive as differences stem not only from differences in the regulation of the national banking systems or the concentration of the banking industry but also from asymmetric information in credit markets. It results that the degree of PT depends on the structural characteristics of the banking system and notably on the health of banks. Since 2007, the world has been through one of the most dramatic financial crises. It is precisely the kind of shock that may trigger a break in the transmission channel of monetary policy (see Melvin and Taylor 2009) as it was transmitted to the financial position of borrowers and lenders. Agency problems may then be amplified and the transmission of monetary policy modified. Kato, Ui and Watanabe (1999) have shown that monetary policy becomes less effective when borrowers' net worth is decreasing since the PT of cuts in the policy-controlled interest rate is weaker. But with the subprime crisis, the financial situation of the lenders – the banking system – must also be taken into account as banks incurred severe losses and faced stronger capital constraints. The lending channel precisely stresses that the health of banks influences the transmission of monetary policy. It can be first argued that the effects of monetary policy may be smaller when banks are constrained by regulatory requirements. Even if monetary policy is eased, banks cannot expand credits since they can hardly raise new equity. But at the same time, van den Heuvel (2002) argued that an expansionary monetary policy will alleviate the capital constraint by improving bank profits and will then become more efficient. The consequences of the financial turmoil on the bank interest rate PT are then uncertain and become an empirical issue. The aim of this paper is then twofold. First, it aims at assessing the degree of heterogeneity of the transmission of monetary policy through national retail bank interest rates. Then, we test whether the PT of policy controlled interest rates to retail bank interest rates has changed with the financial crises.

Numerous studies have been done on the PT of monetary transmission in the euro area, notably taking into account the occurrence of breaks. Hofmann (2006) found out for example that business lending rates had become more responsive to money market rates after the start of EMU[1] in France, Italy and Spain but not in Germany. Following Sorensen and Werner (2006), we estimate a SUR-ECM model where we add a break. This approach is well suited as it rests on a panel technique in which heterogeneity is largely taken into account.

[1] See also Mojon (2001), Heinemann and Schüler (2002), Graeve et al. (2004), Gambacorta (2004), Sander and Kleimeier (2004) and Marotta (2009). These papers generally highlight a convergence of the transmission process, which results from monetary integration.

We find evidence of several breaks in the transmission of monetary policy since the outbreak of the crisis. But the major one appears to be in October 2008 after the collapse of Lehman Brothers. The long-term PT of the ECB rate to the business lending rates then declined. Nevertheless, the financial crisis seems to have promoted a PT more homogenous between Eurozone members. The rest of the paper is organized as follows: section 2 sums up the econometric approach and results are provided in section 3 and 4.

2. Empirical approach

The empirical approach is based on the estimate of the marginal cost pricing model:

$$br_{i,t} = \gamma_0 + \gamma_1 mr_{i,t} \quad (1)$$

where ($br_{i,t}$) is the retail bank interest rate set by the country (i) at the date (t) ; ($mr_{i,t}$) is the money market rate; (γ_0) is a constant markup and (γ_1) is the degree of PT. In order to capture the impact of monetary policy decisions, we use EONIA (Euro overnight index average) rate as a proxy of the ECB refinancing rate. Indeed the main refinancing operation rate has very little fluctuation. Besides, the EONIA is the rate that the ECB tries to influence through its refinancing operations and through the marginal facilities (see de Bondt 2005). In normal times, EURIBOR rates would also be good indicators of the monetary policy stance as they move in a fairly unified fashion but, with the financial market turbulences, this relationship has been impaired. Interbank market has been highly disrupted and a risk premium appeared on EURIBOR rates so that monetary policy stance would be less reflected by these rates.

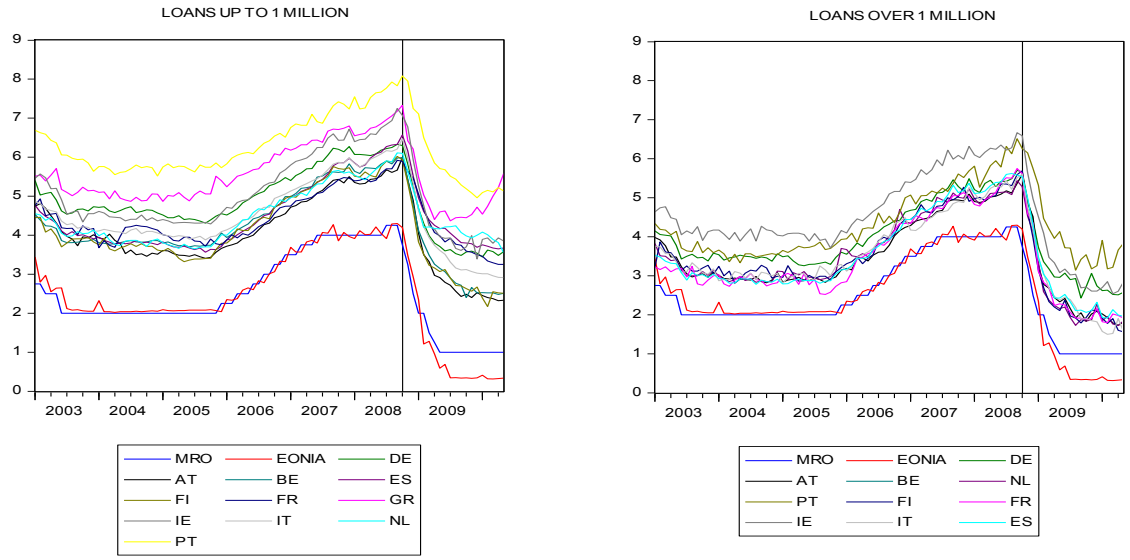
To avoid breaks in the sources of the data on bank interest rates, we use the harmonized database provided by the ECB since 2003. Empirical results might indeed be sensitive to the choice of the database (see Marotta 2008). Data cover interest rates which are applied by resident monetary financial institutions to euro-denominated loans to non financial corporations. A distinction is made by the ECB between loans up to one million euros and loans over one million euros. This distinction may be useful here as the credit channel emphasizes that "small" firms are more sensitive to monetary policy decisions than "bigger" firms (see Kashyap and Stein 1995). They may indeed suffer from a higher degree of asymmetric information. The empirical literature based on micro data is using several proxies to capture this effect. Chatelain, *et. al.* (2003) proxied this "size" effect by the log of total assets of firms, the ratio of liquid assets or the ratio of capital and reserves to total assets. Here, we may capture this effect by assuming that these two types of loans are addressed to different kinds of firms. Loans up to 1 million euros are in general given to small and medium firms for which banking loans are the main source of external funding. Loans over 1 million euros are addressed to firms that would be able to raise funds on capital markets. For these firms, banks are thus in competition with financial markets so that we may suppose that banks integrate the monetary shocks more rapidly. We expect that the PT for loans over 1 million euros should be higher and quicker than for loans up to 1 million euro. Data are extracted from January 2003[2] to May 2010 and are collected for eleven Eurozone countries[3]. The retail interest rates used in the estimates are illustrated in Figure 1 with the ECB's main refinancing operation interest rate (MRO) rate and the EONIA. We can observe that the two

[2] This is indeed the first date for which harmonized data are available.

[3] Austria (AT), Belgium (BE), Finland (FI), France (FR), Germany (DE), Greece (GR), Ireland (IE), Italy (IT), Spain (ES), Portugal (PT) and the euro area (ZE).

types of loans reflect two types of market segments. For all countries, the interest rates for loans over 1 million euros are lower than for loans up to 1 million euros. This is consistent with the credit view according to which agency problems are enhanced for small firms.

Figure 1: Banking Interest rates



Source: ECB

We first run panel unit-root tests to take into account the fact that interest rates are potentially non-stationary time series. For each test we find that the variables are stationary in difference[4]. Therefore, we analyse the relationship between bank interest rate and monetary policy rate in an error correction model. Recently, Mark, Ogaki, and Sul (2005) extended the DOLS method, developped by Stock and Watson (1993), to panel cointegration and thus defined "*a parametric method for estimating multiple cointegration regressions called the Dynamic Seemingly Unrelated Regression (DSUR)*". This methodology is also called SUR-ECM methodology and was applied by Moon and Perron (2005) for testing the purchasing power parity and it was also applied to monetary policy transmission by Sorensen and Werner (2006). With this approach we can account for heteroskedasticity and contemporaneous errors correlation. It seems that this is consistent with the fact that all bank interest rates in the Eurozone are not only driven by structural variables but also by a unique monetary policy. Starting from the long-run equation (1), we estimate the following error-correction model:

$$\Delta br_{i,t} = \alpha_i + \theta_i \left(br_{i,t-1} - \beta_i mr_{i,t-1} \right) + \gamma_i \Delta mr_{i,t} + \tau_i \Delta mr_{i,t-1} + \rho_i \Delta br_{i,t-1} + \varepsilon_{i,t} \qquad (2)$$

The changes in bank lending rates $\left(\Delta br_{i,t}\right)$ are determined by adjustments towards long term equilibrium between bank interest rates and the money market rate $(mr_{i,t})$. $\left(\beta_i\right)$ measures the

[4] The results are not reproduced here for reasons of space but they are available upon request.

long term PT of monetary policy. (θ_i) reflects the speed of adjustment to the long term equilibrium and $(\gamma_i + \tau_i)$ measures the short-term PT of money market interest rates to the retail bank interest rates. With this framework, we can test the homogeneity of the coefficient across countries and thus compare and quantify the degree of heterogeneity in the transmission of monetary policy through the values taken by the short-term and the long-term parameters of the PT.

3. Breaks in the monetary policy transmission

Before analysing in depth the heterogeneity of the PT in the EMU countries, we first consider the hypothesis that a break in the transmission of the common monetary policy has occurred. We have indeed argued that the financial crisis is a potential source of shock for the transmission of monetary policy. In order to test this hypothesis, we run Chow break tests for different dates. Some results of these break tests are reported in table 1. We show that we can identify multiple breaks during this period, but the main one, characterized by the higher Chow statistic, occurred in October 2008[5]. Even if the crisis for the banking system started during the summer 2007, it seems that the collapse of Lehman Brother is clearly the biggest shock.

Table 1: Chow break test for different dates for the SUR-ECM model

	Business loans for NFC below 1 million €	*Business loans for NFC above 1 million €*
July 2007	73,76***	12,21***
March 2008	267,56***	91,82***
September 2008	531,89***	287,31***
October 2008	618,66***	330,79***

*(This table provides the Chow statistic. The null hypothesis is the absence of structural change. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.)*

The Chow test is then applied for each market, for the SUR-ECM model and for each individual country. The Chow statistic indicates that the null hypothesis of no break is clearly rejected for the SUR-ECM models (see table 2). The break is confirmed for all countries individually except for France and only for loans below 1 million Euros. Then, these different results confirm that the monetary transmission process has changed with the financial crisis. The liquidity squeeze that occurred in the interbank market reflected the increased fragility of the banking system and then the way they pass-through monetary policy decisions.

[5] We add on the Figure 1 bars that show the major break in October 2008.

Table 2: CHOW Break test in 2008m10

	Business loans for NFC below 1 million €	*Business loans for NFC above 1 million €*
Austria	6,25***	5,36***
Belgium	7,49***	6,59***
Finland	5,06***	8,15***
France	1,61	2,38***
Germany	6,26***	7,10***
Greece	6,87***	NA
Ireland	6,90***	5,67***
Italy	10,22***	4,47***
Netherlands	2,75***	2,86***
Spain	9,14***	7,28***
Portugal	4,01***	2,56***
SUR-ECM	618,66***	330,79***

*(This table provides the Chow statistic. The null hypothesis is the absence of structural change. The break is estimated in October 2008. For each individual country and for the euro area as a whole, tests are implemented with univariate ECM estimated by OLS. . ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively)*

4. **Heterogeneity in the euro areas's common monetary policy transmission**

We first consider the results for the interest rates applied to loans up to one million euros. As we have argued, these "small" loans are supposed to be granted to "small" firms, that are supposed to be bank-dependent. It seems that the short-term PT has decreased for most of the countries after the start of the crisis (table 3). It has notably become non significantly different from zero in Austria, Belgium, Germany, Spain, Finland, Greece and in the Netherlands. It also appears that the long-term PT has been reduced after October 2008 in all countries but Greece. The long-term PT was indeed complete (i-e not statistically different from unity) for Austria, Belgium, Finland, France, Italy and Netherlands in the pre-crisis period. In the crisis period, Greece is the only country where the long-term PT has become complete. This result which is at odds with the evidence found in the other countries may reflect the premises of the sovereign debt crisis in the Eurozone. The spread with the German long-term public interest rate started to increase significantly in 2009. Consequently, banks in Greece may have been more sensitive to the monetary policy decisions. For the other countries, the transmission of monetary policy has been impaired as banks have resorted to other means to set the credit supply. The financial crisis has indeed triggered a tightening of credit standards as measured by the bank lending survey (Figure 2), which may have explained a disconnect between the policy rate set by the ECB and the retail bank interest rates. Thus, despite the ECB cuts in the policy interest rates, banks faced higher costs of financing which may explain why the PT has lowered.

Table 3:Transmission of monetary policy to bank interest rates applied for loans to non-financial corporations, up to 1 million euros,

	Short-term		***Long-term***		***Speed of Adjustment***	
	Pre-crisis	crisis	Pre-crisis	crisis	Pre-crisis	crisis
AT	**0,10**	**-0,07**	**1,01**	0,73	-0,28	-0,80
	(0,72)	(0,13)	(0,00)	(24,76)	(27,62)	(38,57)
BE	0,21	**0,07**	**0,99**	0,51	-0,23	-0,42
	(4,53)	(0,15)	(0,01)	(10,04)	(13,76)	(8,58)
DE	0,25	**0,14**	0,93	0,66	-0,26	-1,14
	(6,89)	(1,74)	(14,39)	(181)	(19,08)	(52,50)
ES	0,16	**-0,06**	1,21	0,29	-0,22	-0,31
	(3,07)	(0,37)	(12,01)	(28,06)	(34,15)	(13,48)
FI	0,32	**-0,01**	**1,03**	0,66	-0,30	-0,53
	(5,75)	(0,01)	(0,41)	(9,66)	(19,06)	(11,70)
FR	**0,13**	0,21	**0,87**	0,46	-0,21	-0,18
	(0,82)	(2,96)	(2,00)	(12,60)	(9,92)	(7,77)
GR	0,38	**0,33**	0,89	**1,30**	-0,41	0,35
	(5,76)	(1,20)	(5,14)	(1,33)	(18,71)	(6,65)
IE	0,69	0,77	1,20	0,89	-0,24	-1,21
	(24,71)	(11,30)	(6,71)	(8,25)	(10,25)	(21,21)
IT	0,15	-0,17	**1,01**	-0,3	-0,29	-0,18
	(2,92)	(3,28)	(0,08)	(7,56)	(40,32)	(6,30)
NL	0,30	**-0,05**	**0,95**	0,15	-0,26	-0,21
	(7,05)	(0,13)	(0,75)	(16,39)	(15,42)	(6,91)
PT	**0,05**	0,35	0,91	0,73	-0,44	-0,44
	(0,14)	(3,33)	(4,86)	(10,68)	(35,70)	(12,93)

(Short-term: null hypothesis: coefficient = 0; Long-term: null hypothesis: coefficient = 1; Adjustment: null hypothesis : coefficient = 0, In bold Short-term: short-term coefficients are null at the level of 10 %,(no PT in the short-term) In bold long-term: long-term coefficients are equal to the unity at the level of 10 % (PT is completed on the long term) In bold speed of adjustment : coefficients are null at the level of 10 %)

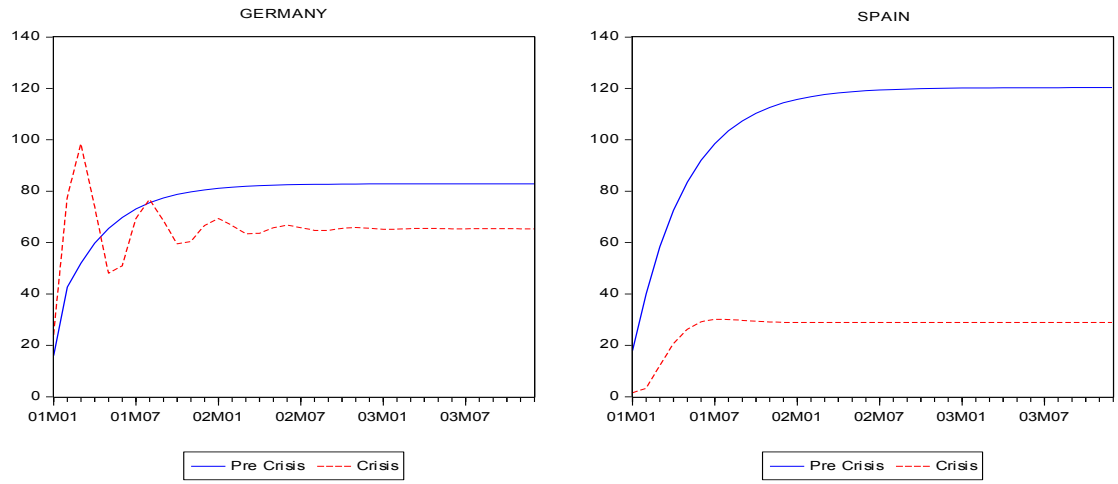
These results are also illustrated in Figure 2 where we have simulated the reaction function of the bank interest rate to an increase of the policy rate of 100 basis points for Germany and Spain[6]. In the pre-crisis period, the long-term PT was above unity for Spain whereas it was not complete for Germany. This result highlights strong differences in the transmission of monetary policy. It must also be stressed that from 2003 to 2008, retail interest rates applied to non financial corporations were lower in Spain than in Germany. This difference in the monetary policy

[6] Simulations for others countries are available upon request.

transmission may then have contributed to differences in business cycles. Private investment has notably been more sustained in Spain than in Germany. Quantifying precisely the role of monetary policy transmission in the business cycle goes beyond the aim of this paper. These results suggest that it may have played a role. During the crisis period, the long-term PT fell sharply in Spain and went below the German banks PT. It may reflect the fact that the Spanish banking responded less to policy interest impulses than German banks during the crisis. They may have faced more liquidity constraints and consequently higher costs of financing which forced them to set a higher risk premium on interest rates applied to loans granted to non financial corporations. The PT has also decreased in Germany implying that German's banks might have also suffer from liquidity constraints but to a lesser extent than in Spain.

Finally, the speed of adjustment parameter has increased during the financial crisis in six member states (Austria, Belgium, Germany, Spain, Finland and Ireland) whereas it has decreased in four (France, Greece, Italy and The Netherlands). The speed of adjustment is constant in Portugal.

Figure 2: simulation of the effect of an Eonia's impulse of 100 basis points on the interest rate for loans to firms up to 1 million euros, Germany and Spain



If we turn to loans over 1 million euros, results are very close to the previous ones obtained for loans up to 1 million euros[7] (Table 4). The short-term PT decreased in most countries and long-term PT has decreased in all countries. It must also be noticed that the long-term PT was often found to be complete during the pre-crisis period. Spain was the country with the highest long-term PT whereas the PT of Germany was the lowest. The simulations confirmed these results[8] (see Figure 3). We can also notice that the long-term and the short-term PT are in most cases higher for interest rates applied to bigger loans. This is true for both periods. This result was expected since we generally consider that competition between bank and market funding is stronger for bigger firms. Those firms face a trade-off between market rates and retail bank

[7] It must be stressed that data for Greece are lacking.
[8] Simulations for others countries are available upon request.

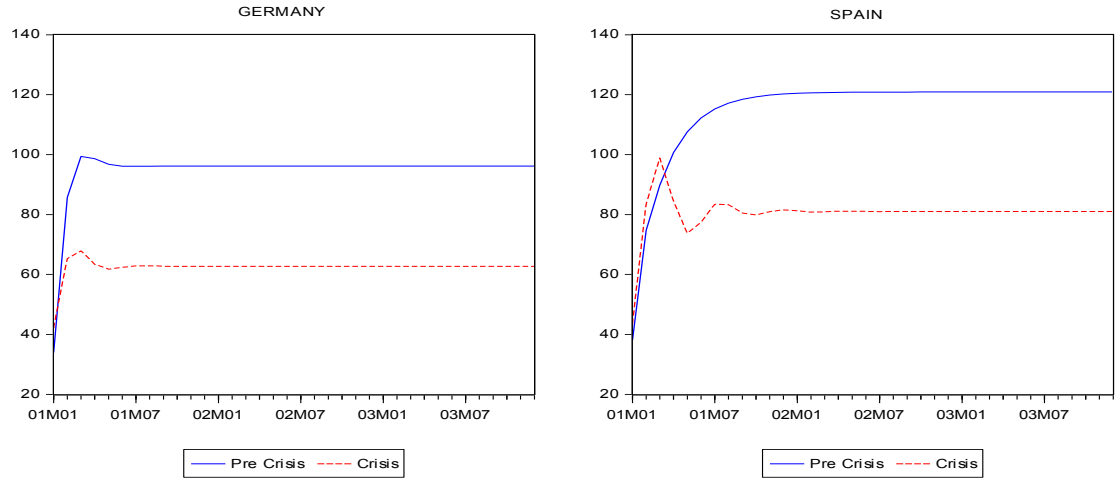
interest rates and may more easily switch from one source of funding to another. Smaller firms are more bank-dependent, which gives more market power for the banking system. Finally, the parameters for the speed of adjustment have generally increased.

Table 4: Transmission of monetary policy to bank interest rates applied to loans to non-financial corporations, over 1 million euros,

	Short-term		***Long-term***		***Speed of adjustment***	
	Pre-crisis	crisisi	Pre-crisis	crisis	Pre-crisis	crisis
AT	0,38	1,42	**1,06**	**0,95**	-0,47	-0,78
	(7,81)	(17,88)	(3,46)	(0,42)	(19,27)	(13,18)
BE	0,45	**0,16**	1,16	0,86	-0,47	-1,04
	(10,28)	(1,14)	(20,53)	(16,38)	(39,35)	(45,95)
DE	0,36	**0,35**	**0,96**	0,63	-0,72	-0,97
	(6,99)	(2,07)	(2,78)	(30,63)	(60,63)	(26,86)
ES	0,45	**0,18**	1,21	0,82	-0,38	-1,19
	(10,77)	(0,65)	(23,53)	(18,53)	(31,25)	(41,23)
FI	0,35	0,55	**1,06**	0,69	-0,56	-0,67
	(3,88)	(4,85)	(2,51)	(6,82)	(20,71)	(16,34)
FR	0,53	1,21	1,17	0,87	-0,35	-1,21
	(8,81)	(16,11)	(7,91)	(4,35)	(20,01)	(11,04)
IE	0,52	**0,07**	1,09	0,74	-0,66	-0,84
	(8,56)	(0,16)	(8,05)	(16,59)	(34,69)	(37,61)
IT	**0,12**	**0,16**	**1,05**	0,31	-0,38	-0,31
	(0,42)	(0,39)	(0,74)	(5,02)	(23,24)	(6,37)
NL	0,69	1,01	1,02	0,86	-0,65	-1,19
	(11,51)	(21,38)	(0,34)	(13,01)	(30,76)	(40,64)
PT	0,39	**-0,17**	**1,16**	0,77	-0,23	-1,61
	(3,58)	(0,17)	(1,56)	(28,63)	(5,90)	(35,30)

(Short-term: null hypothesis: coefficient = 0; Long-term: null hypothesis: coefficient = 1; Adjustment : null hypothesis : coefficient = 0, In bold Short-term: short-term coefficients are null at the level of 10 %,(no PT in the short-term) In bold long-term: long-term coefficients are equal to the unity at the level of 10 % (the PT is completed on the long term) In bold speed of adjustment : coefficients are null at the level of 10 %.)

Figure 3: simulation of the effect of an Eonia's impulse of 100 basis points on the interest rate for loans to firms over 1 million Euros, in Germany and Spain



Finally, a cross-country comparison of these parameters is shown for long-term PT in table 5 for loans up to 1 million and in table 6 for loans over 1 million where we test for pair wise equality. We decomposed these tables in two parts that relate to the two sub-periods defined with the break tests. In the bottom of each table, equality tests relate to the pre-crisis (2003:m01 to 2008:m08) period whereas in the top of each table they relate to the crisis period (from 2008:m09 to 2010:m02). The number of significant combinations in the pre-crisis and during the crisis periods provides information of the degree of heterogeneity among EMU countries. This presentation allows us to quickly identify the overall PT's homogeneity during each sub-period.

After the financial shock in October 2008, the null hypothesis of equality between long-term PT is not rejected for 28 pairs indicating a rise in the homogeneity of the transmission of monetary policy since the financial crisis. So that the general decline observed for the long-term PT is associated with an increase of the homogeneity among the EMU countries. The same conclusion holds for loans over 1 million euro. Before the crisis, there were 22 pairs of long-term PT for which equality could not be rejected. After the crisis, it amounted to 31 (Table 6). It seems then that monetary policy transmission has become more homogenous across EMU countries. This conclusion must yet still be considered cautiously. It must indeed be kept in mind that the mechanisms of transmission of monetary policy have been partly impaired by the financial crisis and the liquidity squeeze that occurred in the interbank market. Banks have tightened credit standards in 2008 and 2009 as they faced considerably higher costs of financing. Consequently, it might be that the retail bank interest rates played a minor role in the determination of supply and demand of credit. Then, the transmission of monetary policy rates to bank interest rates sounds more homogenous whereas actually it did not work over the crisis period.

Table 5: Equality test on the long term PT (loans to non-financial corporations, up to 1 million Euros)

Pre-Crisis Period \ Crisis Period	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT
AT		1,93	1,94	9,7	1,65	4,34	4,17	3,42	4,28	8,36	0
BE	0,017		0,88	1,27	0,09	0,05	6,26	5,63	1,93	1,71	1,75
DE	8,51	12,18		6,85	0,43	1,67	5,84	21,54	3,32	5,41	0,67
ES	13,55	9,95	33,46		2	0,62	12,86	17,12	1,01	0,35	8,87
FI	0,22	0,66	14,45	6,3		0,26	4,98	4,09	2,34	2,44	1,02
FR	1,77	1,84	0,16	12,17	3,32		6,86	7,01	1,37	1,54	2,24
GR	3,42	4,3	1,17	23,46	6,35	0,05		2,64	8,41	13,17	4,38
IE	6,21	8,77	27,35	0	4,42	8,44	16,21		5,66	10,43	2,77
IT	0,04	0,11	12,43	34,01	0,17	2,64	7,01	6,03		0,17	3,89
NL	0,55	0,5	4,44	12,43	1,83	0,76	0,98	11,96	1		6,09
PT	2,39	1,41	1,57	25,62	3,54	0,18	0,12	11,96	4,77	0,44	

(Chi-square statistics is mentioned and when the cell is coloured in gray- it means that the PT between those two countries are equal)

Table 6: Equality test on the long term (loans to non-financial corporations, over 1 million Euros)

Pre-Crisis Period \ Crisis Period	AT	BE	DE	ES	FI	FR	IE	IT	NL	PT
AT		1,4	13,55	4,04	4,54	1,03	4,4	4,35	1,61	3,64
BE	7,4		9,8	0,83	2,23	0,09	3,26	3,22	0	1,88
DE	11,06	55		6,26	0,42	7,6	1,79	1,14	9,6	2,3
ES	12	2,19	51,2		1,13	0,72	1,04	2,63	1,35	0,46
FI	0	4,01	7,05	7,74		1,77	0,1	1,45	2,25	0,26
FR	3,21	0,06	13	0,27	2,92		1,93	3,66	0,02	1,65
IE	0,76	3,41	23,33	7,32	0,54	1,81		1,78	2,43	0,15
IT	0,06	3,97	3,17	10,01	0,03	3,11	0,71		3,12	2,07
NL	1,59	17,35	3,66	22,52	0,84	6,72	4,17	0,33		1,97
PT	0,58	0	2,43	0,1	0,59	0	0,32	0,81	1,26	

(Chi-square statistics is mentioned and when the cell is coloured in gray- it means that the PT between those two countries are equal)

5. Conclusion

In this paper, we aimed at highlighting the consequences of the financial crisis on the transmission of monetary policy to the business lending interest rates in the EMU. We applied a SUR-ECM model, which is a panel method where we have estimated the PT between the ECB's

monetary policy rate, approximated by the Eonia rate, and retail bank interest rates. The main results of this investigation are the following. First, we show that the financial turmoil has affected drastically the interest rate PT in the Eurozone. Second, in most cases, PT has decreased in the long-term. Finally, the homogeneity between the Eurozone members has increased.

These results show us that if we can isolate different market segments according to the loan's amount given to loans, it appears that these two segments are affected in the same way by the financial crisis. They also demonstrate that since the crisis, ECB's monetary impulsions are less transmitted by the interest rate. The transmission mechanism has been impaired by the financial shocks and the banking system suffered from higher costs of financing despite the decrease in the interest rate set by the ECB. From an economic policy viewpoint, these results show that regarding the "OCA meta-property" of homogeneity in the monetary transmission process, the EMU appears more homogenous. Nevertheless, numerous heterogeneities remain. The results for the pre-crisis period notably illustrate that these heterogeneities in the transmission of the common monetary policy may have contributed to the asymmetry of the business cycles observed during that period. A better economic governance seems appropriate to deal with these heterogeneities highlighted in this study.

An interesting topic for future research would be to analyse thoroughly the main determinants of changes in the PT for each member state of the Eurozone. Another issue would also be to deal with the consequences of the heterogeneity; for example, by more closely examining their impact among the housing markets or on the different national business cycles. We should also focus more closely on the effects of the unconventional monetary policy.

Reference

Chatelain, J-B., Erhman, M., Generale, A., Martinez-Pagés, J., Vermeulen, P. and A. Worms (2003) "Monetary Policy Transmission in the Euro Area: new evidence from Micro Data on Firms and Banks" *Journal of the European Economic Association* **1** (2-3), 731-742.

De Bondt, G. (2005) "Interest Rate Pass-Through: Empirical Results for the Euro Area" *German Economic Review* **6** (1), 37-78.

De Bondt, G. (2002) "Retail Bank Interest Rate Pass-Through: New Evidence at the Euro Area Level" ECB Working Paper Series 136.

Di Lorenzo, G. and G. Marotta (2006) "A less effective monetary transmission in the wake of EMU? Evidence from lending rates pass-through" *Journal of Monetary Economics* **4** (2), 6-31.

Gambacorta, L. (2004) "How Do Banks Set Interest Rates?" NBER Working Paper Series 10295.

Graeve, D. De Jonghe, O., and R. Vander Vennet (2004) "The Determinants of Pass-Through of Market Conditions to Bank Retail Interest Rates in Belgium" National Bank of Belgium Working Papers Series 47.

Heinemann, F. and M. Schüler (2002) "Integration Benefits on EU retail Credit Markets-Evidence from Interest Rate Pass-through" ZEW Discussion Paper 26.

Hofmann, B. (2006) "EMU and the transmission of monetary policy: evidence from business lending rates" *Empirica* **33**, 209-229.

Jappelli, T. and M. Pagano (2008) "Financial market integration under EMU" Economic Papers European Economy 312.

Kashyap, A. and J. Stein, (1995) "The Impact of Monetary Policy on Bank Balance Sheets" *Carnegie Rochester Conference Series on Public Policy* **42**, 151-195.

Kato, R., Ui, T. and T. Watanabe (1999) "Asymmetric effects of monetary policy: Japanese experience in the 1990's" Bank of Japan Working Paper Series 2.

Mark, N., Ogaki, M. and D. Sul (2005) "Dynamic Seemingly Unrelated Cointegration Regressions" *Review of Economic Studies* **72**, 797-820.

Marotta, G. (2008) "Lending interest rate pass-through in the euro area. A data-driven tale" CEFIN Working Papers 12.

Marotta, G. (2009) "Structural breaks in the lending interest rate pass-through and the euro" *Economic Modelling* **26**, 191-205.

Melvin, M. and M. Taylor (2009) "The global financial crisis: Causes, threats and opportunities. Introduction and overview" *Journal of International Money and Finance* **28** (8), 1243-1245.

Mojon, B. (2000) "Financial Structure and the Interest Rate Channel of ECB Monetary Policy" ECB Working Paper Series 40.

Mojon, B. (2001) "Structures financières et canal des taux d'intérêt de la politique monétaire dans la zone euro" *Economie et Prévision* (147), 89-113.

Mongelli, F. (2005) "What is European Economic and Monetary Union Telling us About the properties of Optimum Currency Areas?" *Journal of Common Market Studies* **43** (3), 607-625.

Moon, H. R. and B. Perron (2005) "Efficient Estimation of the SUR Cointegration Reegression Model and Testing for Purchasing Power Parity" *Econometrics Review* (23), 293-323.

Sander, H. and S. Kleimeier (2004) "Convergence in the euro-zone retail banking? What interest rate pass-through tells us about monetary policy transmission, competition and integration" *Journal of International Money and Finance* **23** (3), 461-492.

Sorensen, C. and T. Werner (2006) "Bank Interest Rate Pass-Through in the Euro Area" ECB Working Paper Series 580.

Stock, J. and M. Watson (1993) "A Simple Estimator of Cointegration Vectors in Higher Order Integrated Systems" *Econometrica* **61** (4), 783-820.

Van den Heuvel, S. (2002) "Does bank capital matter for monetary transmission?" FRBNY Economic Policy Review, 259-265.

van Leuvensteijn, M., Sorensen, C., Bikker, J. and A. van Rixtel (2008) "Impact of Bank Competition on the Interest Rate Pass-Through in the Euro Area" ECB working Paper series 885.