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Christophe Blot, Fabien Labondance

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CRESE
30, avenue de l'Observatoire
25009 Besançon
France
http://crese.univ-fcomte.fr/

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Beyond the Interest Rate Pass-through: Monetary Policy and Banks Interest Rates during the Effective Lower Bound

Christophe Blot
Sciences Po – OFCE & Université Paris Ouest Nanterre - EconomiX

Fabien Labondance*
Université de Franche-Comté – CRESE & OFCE – Sciences Po

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Abstract

We investigate whether monetary policy influences the retail interest rates in the Euro Area when the policy rate reaches the effective lower bound. We estimate a panel-Error Correction Model that accounts for potential heterogeneities in the transmission of monetary policy. The analysis disentangles alternative non-standard measures implemented by the ECB. We find that unconventional measures have influenced banking interest rates beyond the pass-through of the current and expected policy rate. These effects are driven by liquidity provisions in core countries and by covered bond purchase programmes in peripheral ones.

Keywords: Unconventional measures, retail interest rate, Heterogeneous panel.

JEL Classification : E43, E52, E58, G21.

* Corresponding author: Fabien Labondance Email : fabien.labondance@univ-fcomte.fr

1. Introduction

Banks play a key role in the transmission of monetary policy, notably in the Euro Area (EA) where their loans accounts for the bulk of external funding of firms and households. Consequently, lending conditions matter for central banks which aim to regulate aggregate demand (Altavilla et al., 2020). The interest rate pass-through is therefore a key ingredient of the transmission of monetary policy decisions. Yet, the financial crises in the EA have worsen balance sheets of banks, sovereigns and non-financial corporations and impaired the transmission of monetary policy through the interest rate and the credit channels (Cicarreli et al., 2013).[1] The European Central Bank (ECB) felt concerned with those issues and started to cut the policy rate in September 2008. But, once it had reached the effective lower bound (ELB) in May 2009, the ECB lost its ability to directly influence the short-term cost-of-funding for banks, which may have reduced the effectiveness of monetary policy.[2] Consequently, the ECB decided to extend the operations through which refinancing was provided to banks and to implement asset purchases. These unconventional measures were expected to address the liquidity needs of banks and to influence financing conditions through the effect of purchases on the long end of the yield curve. Besides, financial markets in the EA became more fragmented (Durré et al., 2014; Arnold and Ewijk, 2014; Bouvatier and Delatte, 2015; Mayordomo et al., 2015; Lucotte, 2015)). Consequently, the ECB also sought to "*restore the monetary policy transmission mechanism as correctly as possible*".[3]

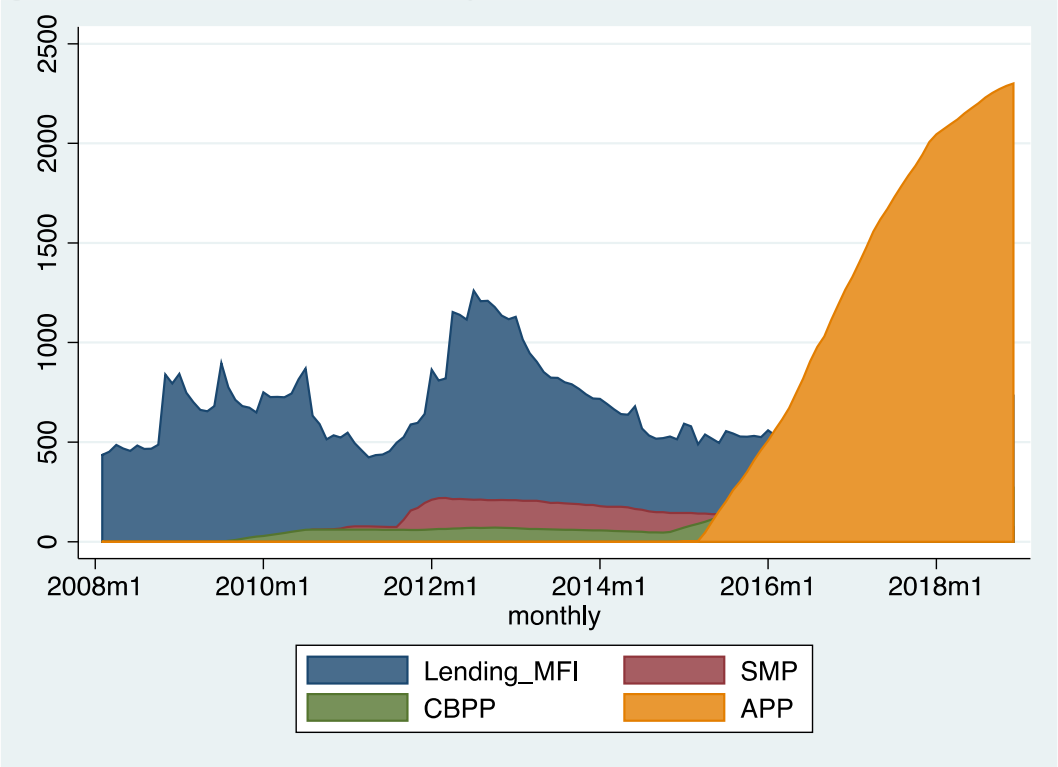
The aim of this article is to assess the efficiency of those unconventional monetary policies in steering retail-banking interest rates beyond the effect of the policy rate. Was the interest rate pass-through channel shut down once the policy rate was at the ELB? We ask whether the non-standard measures implemented by the ECB have contributed to the reduction of the retail-banking interest rates and which of those measures were the most effective. More precisely, as the policy rate was at the ELB, we aim to capture the effect of liquidity programmes and asset purchases through the reductions of term and risk premia.

During the global financial crisis, the ECB has first decreased its main refinancing operations (MRO) rate. According to the standard interest rate channel, these changes are expected to be passed-through short-term money markets rates (EONIA and EURIBOR rates), then to the term-structure of interest rate and finally to the retail banking interest rates. However, once the MRO rate has reached the ELB, the ECB loses its ability to influence market and retail interest rates. Consequently, the ECB resorted to unconventional measures designed to circumvent the ELB, reduce future expected policy rates and tame interest rates premia. During the first stage of the crisis, the ECB decided to provide ample liquidity to the banking system at extended maturities – up to three-year with the VLTRO – to avoid a liquidity squeeze and a credit crunch. It triggered a sharp increase of the balance sheet of the Eurosystem.[4] Then, several assets purchase programmes were undertaken. The Covered Bond Purchase Programme (CBPP1) was introduced in May 2009 and the ECB committed to purchase a given amount of covered-bonds, which is a source of funding for the banking system in the EA. It was extended in November 2011 (CBPP2). The aim was to ease funding conditions for the

[1] See Altavilla et al. (2019a) for a comprehensive analysis of funding costs of banks in the euro area and Darracq Paries et al. (2014).
[2] The concept of effective lower bound suggests that the policy rate has reached a lower bound which is close but different from zero and is expected not to be decreased further. It is therefore more appropriate than the zero lower bound even if in practice, the policy rate was reduced later and reached the zero lower bound in March 2016.
[3] The expression was first pronounced by Jean-Claude Trichet the 3rd of February 2011. It was then often used both by Jean-Claude Trichet and Mario Draghi.
[4] Liquidity was provided though an extension of the maturity of the LTRO (long-term refinancing operations). In December 2011 and February 2012, the ECB granted liquidity up to a 3-year maturity (VLTRO for very-long term refinancing operations). Finally, in 2014, the ECB conditioned liquidity provision to the credit growth of banks (TLTRO: targeted long term refinancing operations).

banking system. The Securities Market Program (SMP) in 2010 and the announcement of the Outright Monetary Transaction (OMT) in September 2012 intended to repair the monetary policy transmission mechanism impaired by the rise of sovereign risk in a few countries. Assets' purchase policy was amplified in 2015 when the ECB implemented the asset purchase programme (APP) to deal with low growth and low inflation in the EA. The APP entails purchases of public securities (PSPP), asset-backed securities (the ABSPP launched in November 2014), corporate sector securities (CSPP launched June 2016) and CBPP3 previously launched in September 2014. Figure 1 shows the amount spent by the ECB for these non-standard measures

Figure 1. Breakdown of the Eurosystem's non-standard measures (billion €)



Source: ECB.

Liquidity provisions and asset purchases work through different channels. Gurkaynak et al. (2005) show that a monetary policy decision provides information on the future policy path of monetary policy and shape interest rates expectations. This channel is clearly at work with forward guidance announcements (Hubert and Labondance, 2018) but also with asset purchase as announcements signal that monetary policy will remain accommodative in the future (Krishnamurthy and Vissing-Jorgensen, 2011; Bauer and Rudebush, 2014). It may also be the case with liquidity provision notably when the maturity of those operations is extended. According to the portfolio-rebalancing channel, asset purchases are supposed to reduce the term premia. They may also reduce the default risks for sovereigns, as far as the bulk of purchases is concentrated on public securities. Finally, all those measures would also improve the economic outlook reducing the external financial premium for firms and households.

To assess the effect of these quantitative measures on the banking interest rates in the EA beyond their policy path signal, we resort to a panel approach that accounts for potential heterogeneities in the transmission of monetary policy during the ELB period. We estimate panel Error correction models (ECM) over a period spanning from May 2009 to December

2018. We use the mean-group (MG) estimator proposed by Pesaran and Smith (1995) since it enables to account for heterogeneity in non-stationary panels. Panel-ECM models are estimated for a panel of 15 EA countries. We consider 6 retail-banking markets: housing loans, loans for consumption, loans to non-financial corporations (NFC) below 1 Million € and over 1 Million € and deposit rates for household and NFC. We analyse the effectiveness of the measures taken since 2009, disentangling the effect of the lending operations to monetary and financial institutions (MFI) from asset purchases.

The main results of the article are the following. First, we find that even if the ECB was constrained by the ELB, the signal sent through its policy path announcements had a significant impact on retail banking interest rates. This is measured through the relationship between investors' expectations of the future short-term interest rate – proxied with 10-year Overnight Indexed Swaps (OIS) – and retail interest rates. Second, among the measures implemented by the ECB, CBPP and liquidity operations are the most effective to dampen risk and liquidity premia. There is less evidence of the effectiveness of the SMP and the APP – which mainly consisted in public securities purchases – beyond their transmission to the OIS rate. Finally, our analysis indicates that during the ELB, liquidity provisions have been especially effective to influence retail interest rates in core countries while CBPP was more useful to that aim in peripheral ones. This last result may be connected to the important development of covered bonds markets in these countries during the last decade (see European Covered Bond Council, 2020).

This article is related to the literature devoted to the effectiveness of unconventional measures and on the pass-through of market and policy rates to the retail-banking interest rates.[5] Aristei and Gallo (2014), Gambacorta et al. (2015) and Blot and Labondance (2013) document this point and suggest that heterogeneity has increased during the financial crisis. Ouerk et al. (2020) suggest that the zero lower bound has decreased the efficiency of monetary policy and accentuated the heterogeneity of the EA . The evidence of significant distortions in the interest rate pass-through is less clear for Illes et al. (2019) and Altavilla et al. (2021) show that the pass-through is not impaired when policy rates move into negative territory. Gambacorta et al. (2015) argue that cross-country differences in the pass-through of money market rate to lending rates results from the risks associated to borrowers and depends on lenders characteristics. Besides, using information on banks and firms in Italy, Gambacorta and Mistrulli (2014) find that lending interest rates increased less since the bankruptcy of Lehman Brother when banks are better capitalized and for firms engaged in long-term relationship with banks. Hristov et al. (2014) suggest that the increase in the retail bank spreads in the EA would mainly result from an increased volatility of shocks in the periphery rather than from a significant divergence in the interest rate pass-through between the core countries and the periphery. Besides, the rise in the sovereign risk premia for peripheral countries have been transmitted to the cost of funding for banks. As reported by Bouvatier and Delatte (2015), crises have triggered a halt in international banking activities leading to fragmentation (Reichlin, 2014).

As the effectiveness of monetary policy at the ELB cannot stem from the change in the short-term risk-free rate, it mainly hinges on its ability to reduce risk premia faced by sovereigns,

[5] Several papers - focusing on the euro area – assess the effects of unconventional measures in mitigating tensions in the interbank market (Abenassi and Linzert, 2012), in reducing sovereign yields and sovereign debt spread (Szerbowicz (2015), Altavilla et al. (2016), Gibson et al. (2016), Ghysels et al. (2016), Blot et al. (2020a), Altavilla et al., (2019b) and De Santis (2020)), in supporting credit activity (Giannone et al. (2012), Martins et al., (2019)), inflation and economic activity (Gambacorta, et al. 2014), credit conditions (Ciccarelli et al. (2013)) and asset prices (Rogers et al. (2014), Alessi and Kerssenfischer (2019) and Blot et al. (2020b)). The literature on the pass-through has been initially developed by Cottarelli and Kourelis (1994), Cechetti (2001), Mojon (2000 and 2001).

banks, non-financial corporations, and households. This issue is notably dealt with by von Borstel et al. (2016) who disentangle the effect of monetary policy during the sovereign debt crisis period on short-term, long-term risk-free rate, sovereign funding cost and retail-market interest rate. Von Borstel et al. (2016) emphasize the transmission on monetary policy measured by a single indicator – the shadow rate – on several interest rates. Here, we focus on the retail-markets and disentangle the effect of different non-standard measures. Our article is also close to Altavilla et al. (2020) who use monthly-disaggregated data allowing them to consider banks' characteristics. They find that TLTRO and APP (i.e post 2014 measures) helped to normalize lending conditions across countries by reducing the cross-sectional dispersion of lending rates. Here, we follow a time series methodology and do not account for bank's characteristics but for country heterogeneity. After identifying a break in the long-run relation between the policy rate proxied by the EONIA and lending rates on new loans in September 2008, Gambacorta et al. (2015) report that unconventional measures proxied by the ratio of the size of central bank's balance sheet to GDP has contributed to restore cointegration. Creel et al. (2015) identify the policy shock (for conventional and unconventional measures) from a VAR model estimated with EA aggregates and assess the response of bank interest rates applied to households and NFC to the shocks identified in the first step. Their results suggest that the SMP and the CBPP have helped to reduce retail banking interest rates in Italy and Spain. In this article, we aim to be more comprehensive since we consider the effect of 4 distinct measures – lending to MFI, CBPP, SMP and APP – on a panel of 15 EA countries.

2. ECB monetary policy transmission through the term-structure of interest rate

In the EA, changes in the MRO rate – set by the ECB – are first passed-though short-term money markets rates (EONIA and EURIBOR rates), then to the term-structure of interest rate and finally to the retail banking interest rates. In normal times, the central bank steers the short-term interest rate. For given term and risk premia, it directly influences the retail interest rates applied by banks. Yet, the transmission may be incomplete depending on structural domestic characteristics of the financial architecture that influence banks' mark-up. [6] Consistently, in the standard approach, the interest-rate pass-through of monetary policy to the retail interest rates is assessed with the following long-term relationship:

$$rb(k,i,t) = \alpha + \beta.mpr(t) \quad (1)$$

Equation (1) relates retail-interest rate (rb) in country (i) at time (t) for a market (k) to the policy rate (mpr). α stands for a constant mark-up over the policy rate and β captures the long-term pass-through. [7]

However, during financial turmoil, the transmission of monetary policy has been affected by a dramatic rise in the level and volatility of term and risk premia. With the banking crisis, fear of banks insolvency led to a rise in their cost of funding relative to the corresponding maturity sovereign market rate. With the economic recession, banks may have revised upward the counterparty risks of loans to non-financial corporations and households and consequently ask for a higher external finance premium. Finally, the sovereign debt crisis has induced a rise

[6] These domestic characteristics (degree of competition) explains some degree of heterogeneity in the transmission of the common monetary policy across countries (Leroy and Lucotte, 2015).
[7] See Sander and Kleimeier (2004), de Bondt (2005), Marotta (2009), Belke et al. (2013) and Andries and Billon (2016) for a survey on the empirical literature devoted to the retail bank interest rate pass-through.

in the sovereign risk in some countries (notably Greece, Portugal, Spain, Italy, and Ireland). These effects may mitigate the standard effect of monetary policy through the interest rate channel. To deal with these issues and to account for the effect of unconventional measures, we need to consider term and risk premium explicitly. To that end, equation (1) is decomposed in the following way:

$$\begin{cases} r_f(m,t) = \prod_{j=0}^{p}(1 + E_t[mpr(t+j)]) + \Phi_{term}(m,t) & (2) \\ sovyield(i,t) = r_f(m,t) + \Phi_{sov}(i,t) & (3) \\ rb(k,i,t) = \alpha + \beta.sovyield(i,t) + \Phi_b(i,t) & (4) \end{cases}$$

where $r_f(m,t)$ in equation (2) stands for the risk-free rate at maturity m. It can be represented as the average of the current monetary policy interest rate ($mpr(t)$) and future expected policy rates $E_t[mpr(t+j)]$. The sovereign yield in equation (3) equals the corresponding maturity risk-free rate plus a term premium and a sovereign risk premium $\Phi_{sov}(i,t)$.[8] Finally, equation (4) shows that the interest rate applied by banks on the retail market, $rb(k,i,t)$ on market (k), will depend on the corresponding sovereign yield and a risk premium summarizing risks of banks and non-financial agents, captured by $\Phi_b(i,t)$, notably capturing the external finance premium.

As firms and households in the EA rely strongly on banks funding, those retail markets rates play a crucial role for investment and final consumption decisions. This representation accounts for the institutional special features of the EA and the partial financial integration of sovereign debt markets and banking systems. Consequently, the transmission of monetary policy in each member state hinges on the pass-through of policy decisions in each domestic sovereign and retail banking markets.

In what follows, we assess whether monetary policy decisions have been transmitted to the retail banking interest rates. However, equation (1) does not allow us to analyse the effect of monetary policy at the ELB since the policy rate is bounded and since it does not capture the effect of unconventional measures. Estimations will then be based on the following equation, which stands for a simplified representation of the transmission channel of equations (2), (3) and (4):

$$rb(k,i,t) = \alpha + \beta.OIS(m,t) + f(\Phi_b(i,t), \Phi_{sov}(i,t), \Phi_{term}(t)) \quad (5)$$

where $OIS(m,t)$ is the OIS rate at maturity (m). It is a measure of the average investor expectations of the overnight rate (EONIA) at this maturity. The variable $OIS(m,t)$ enables to capture the effect of monetary policy through the current monetary policy rate and expected future monetary policy rate.[10] It will therefore capture the future policy path of monetary policy resulting from forward guidance announcements, but also the signalling effect of asset purchases and liquidity operations. At the ELB, it is a good measure of the policy stance since it accounts not only for the current policy rate, which is supposed to be bounded, but also for

[8] In this simplified representation, we do not account for liquidity premia, which refers to the ability to sell an asset quickly. It is mainly related to the volume of transactions, which may be scarce. Here, we do not seek to disentangle pure liquidity risk and counterparty risk. In crises periods, those risks are hard to isolate and fear of insolvency will trigger a liquidity squeeze.

[10] Assuming that there is no opportunity of arbitrage, the OIS rates would reflect risk-adjusted financial market participants' expectations of the average policy rate over the horizon corresponding to the maturity of the swap (see Bauer and Rudebusch 2014).

the future path of policy rates.[11] Liquidity provisions and assets purchases programmes are expected to influence the retail banking interest rates through the term $f(\Phi_b(i,t), \Phi_{sov}(i,t), \Phi_{term}(t))$. By providing liquidity to banks in distress, those operations have alleviated the liquidity squeeze but also their solvency risks contributing to a reduction in $\Phi_b(i,t)$. The degree of risk in the banking system could indeed influence their cost of external funding, which is passed-through retail interest rates. Besides, it has also been claimed that banks have used these liquidity to purchase government bonds that tamed the rising spreads on sovereign debt markets and then reduced $\Phi_{sov}(i,t)$. Finally, asset purchases are supposed to reduce the term premia $\Phi_{term}(m,t)$ through the portfolio-rebalancing channel. They may also reduce the default risks for sovereigns, as emphasized by Blot et al. (2020a), von Borstel et al. (2016), Ghysels et al. (2016) and Szczerbowicz (2015).

Equation (5) is estimated in a panel setting. However, we aim to consider that monetary policy has affected sovereign yields and retail interest rates differently during the crisis. The standard fixed-effect model is not able to capture all the potential sources of heterogeneities. Consequently, we use the mean-group (MG) estimator proposed by Pesaran and Smith (1995), which is better suited for nonstationary heterogeneous panels. The following error-correction model is estimated:

$$\Delta rb_{j,t,k} = \delta_{j,k} + \alpha_{j,k}\left(rb_{j,t-1,k} - \lambda_{j,k}.OIS10Y_{t-1} - Unconv_{t-1}\right) + \sum_{l=1}^{p1}\rho_{j,k,l}\Delta rb_{j,k,t-l} + \sum_{l=1}^{p2}\gamma_{j,k,l}\Delta OIS10Y_{t-l} + \sum_{l=1}^{p3}\theta_{j,k,l}\Delta x_{j,t-l} + \varepsilon_{j,k,t} \quad (6)$$

with

$$Unconv_t = \gamma_{j,k}^{CBPP}.CBPP_t + \gamma_{j,k}^{SMP}.SMP_t + \gamma_{j,k}^{PSPP}.APP_t + \gamma_{j,k}^{liquidity}Lending\_MFI_t \quad (7)$$

where $rb_{j,t,k}$ is the retail-banking interest rate for country (j), at date (t) for each retail-banking market (k), 10 year *OIS* rate stands for the indicator of market rate , $Unconv_{t-1}$represents the four unconventional measures (CBPP, SMP, APP and lending to MFI) and $x_{j,t}$ are control variables including domestic inflation and an aggregate risk measure (the VIX). The cross-country differences in inflation may lead to heterogeneities in the nominal retail bank interest rates. It is expected to have a positive sign.[12] The VIX is a proxy for global risk that may be transmitted to interest rates set by banks.

Data for retail banking interest rates are collected from the ECB MIR database on a monthly frequency. Empirical analysis is carried out for loans to households (for consumption and house purchases), for loans to NFC (loans below one million euro and loans over one million euro) and for deposits made with agreed maturity by households and NFC. For each retail market, interest rates are provided for several maturities. We focus on series called "total maturity", which provides a reference rate summarizing all maturities. Data are collected for 15 countries: Germany (DE), France (FR), Italy (IT), Spain (ES), the Netherlands (NL), Belgium (BE), Ireland (IE), Austria (AT), Finland (FI), Portugal (PT), Greece (GR), Cyprus (CY), Slovenia (SI), Lithuania (LT) and Slovakia (SK). To deal with missing values, we use interest rates data equivalent collected from national central banks.[13]

[11] Von Borstel et al. (2016) use the difference between the 10-year OIS rate and the Eonia to capture the the term spread.

[12] The estimation could also account for heterogeneity in the business cycle. To that end, country Industrial production may be introduced in the estimation in the short-term dynamics. However, this variable is never significant and does not improve the estimations.

[13] The main adjustments have been realized for Greek interest rates where interest rate data on « total » maturity exhibits missing points. Yet, these series are generally highly correlated with the interest rate for agreed maturity up to one year. Missing values have been replaced with interest rates on loans below one million euros for NFC, interest rates with an agreed maturity up to one

The 10-year OIS rate stands for the indicator of the current and expected future policy rate. Among unconventional measures, we consider the outstanding amount of the CBPP, the SMP and the APP calculated as *securities held for monetary purposes* (item 7.1 in the consolidated weekly financial statement of the Eurosystem) net of the CBPP and the SMP. Lending to MFI corresponds to *Lending to euro area credit institutions related to monetary policy operations denominated in euro* (item 5 in the consolidated weekly financial statement of the Eurosystem).[14] Inflation is measured with the harmonized consumer inflation (HCPI). Systemic risk is measured by the VIX. Data sources are provided in Table A in the Appendix.

As the aim of the article is to assess whether monetary policy has kept influence over the retail interest rates during the ELB period, we need to identify the start of the ELB period. Strictly speaking, the MRO rate reached 0% in March 2016 while the EONIA had reached this level in July 2014 only. However, it was considered that the policy rate attained a floor before that date. The prolonged period, starting in May 2009, where the MRO rate was maintained at 1% was considered as the lower bound by most ECB watchers as no further cut was expected. It has also coincided with the implementation of unconventional measures. The CBPP programme was indeed announced in May 2009. Consequently, in the rest of the article, we consider that the ELB starts in May 2009 and estimate equation (6) from May 2009 to December 2018.

3. The effects of unconventional measures on banking interest rates

Equation (6) relies on the implicit hypothesis that there is a long-term relationship between retail interest rates and the policy rate. We first test for cointegration following the Westerlund (2007) approach, which is suited for heterogeneous panels. The null hypothesis of no cointegration between the retail-banking interest rate and the OIS 10-year rate is clearly rejected for all markets (see Table B in the appendix). Moreover, the panel statistics suggest a cointegration relationship for all countries. We thus conclude that the dynamic of retail-banking interest rates is best represented by an error-correction model.

3.1 Are unconventional measures passed-through the retail-banking interest rates?

We estimate equation (6) using the mean-group estimator proposed by Pesaran and Smith (1995). The number of lags for the first difference of the endogenous variable (*p1*) and for the OIS 10-year rate (p2) has been set according to the average lag length selected by the Akaike information criterion (AIC) when cointegration is tested with (*p1*=*p2*).[15] For other exogenous variables – the control variables – the number of lag (*p3*) is equal to one. The presentation of the results and the conclusion will draw on the long-term parameters.

The country average long-term pass-through of monetary policy decisions is measured by the parameters $\widehat{\lambda_k}$ and $\widehat{\gamma_k^u}$ with $u = CBPP, SMP, APP, Lending\_MFI$. $\widehat{\lambda_k}$ will essentially capture the

year have been used. Data for loans for consumption in the Netherlands are missing from January 2003 to June 2010. Data have then been replaced by data from De Nederlandsche Bank available from January 2003. Data for Italy are also missing for consumption loans before January 2003. Data were also missing for interest from January 2003 to October 2006 on loans over 1 million in Belgium. They have been taken from the National Bank of Belgium but were yet available from March 2003 only. For deposit rates, missing values are taken from the Bank of Greece and De Nederlandsche Bank. The interest rate on deposits rate to households starts in January 2003 in Netherlands.

[14] All the variables related to the asset purchase programmes and liquidity provisions are in current euros and considered in log in the estimations.

[15] It may yet be marginally adjusted to make sure that the MG panel estimation converges.

effect of decisions on interest rates (current and future policy rates). It may consequently account for the increase of the policy rate in 2011 and the subsequent decreases after July 2011. It also accounts for forward guidance announcements – when the ECB provides explicit information on the future path of the policy rate – and for the signalling effect embedded in other non-standard measures. It is expected to be positive and the pass-through is complete when it is not significantly different from one. The results for the baseline estimate are displayed in Table 1, which emphasizes the long-term pass-through and the adjustment speed.

Table 1. The effect of monetary policy decisions on retail banking interest rates

Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
10-year OIS	**0.130***	**0.353*****	**0.142****	0,068	0,036	-0,065
	(0.074)	(0.128)	(0.059)	(0.089)	(0.095)	(0.082)
CBPP	**-0.626*****	**-1.592*****	**-0.662*****	**-0.694****	**-0.857*****	**-0.382*****
	(0.169)	(0.535)	(0.176)	(0.284)	(0.170)	(0.109)
SMP	0,181	-0,207	0,103	0,114	-0,363	0,132
	(0.191)	(0.538)	(0.412)	(0.249)	(0.276)	(0.207)
APP	**0.044***	**0.151*****	0,027	0,052	0,013	**0.045****
	(0.023)	(0.056)	(0.019)	(0.043)	(0.039)	(0.019)
Lending_MFI	**-0.106*****	-0,715	**-0.316****	-0,184	-0,099	-0,066
	(0.040)	(0.485)	(0.141)	(0.145)	(0.154)	(0.087)
Error correction	**-0.754*****	**-0.959*****	**-0.896*****	**-1.436*****	**-0.622*****	**-1.062*****
	(0.040)	(0.485)	(0.141)	(0.145)	(0.154)	(0.087)
Constant	4.229**	15.116***	6.042**	7.280***	3.438***	2.075**
	(0.040)	(0.485)	(0.141)	(0.145)	(0.154)	(0.087)
N	1740	1719	1740	1739	1740	1739
Log-likelihood	1425.558	275.168	868.062	477.525	1281.635	1178.599

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Each column corresponds to the estimation of equation (6) using the mean-group estimator. Six retail banking interest rates are explained on a panel of 15 EA Countries over the sample 2009m5-2018m12. For sake of parsimony, we do not show the estimates of the controls and of the lags of the unconventional measures in the short-term dynamics.

For each market, the error-correction term is significantly negative and sometimes close or above one indicating a very high speed of adjustment and some over-shooting. The long-term effect of the 10-year OIS is only significant for loans to households – either for house purchase or consumption – and for loans to NFC below 1 million €. Those loans are granted to small and medium sized firms whereas loans above 1 million € would be directed to more important firms, which may also have access to financial market funding.

The parameters of the long-term pass-through of interest rates decisions suggest that they have been lower during the financial crisis compared to their estimates before (Blot and Labondance, 2013; Arestei et al., 2014)) and not complete (below one). It would be consistent with the fact that during the ELB, interest rates played a minor role in the conduct of monetary policy and henceforth as a reference value for retail banking interest rates. Yet, the effect remains significant for 3 out of 6 markets, which may also capture the signalling channel of asset purchases and liquidity provisions on the expected policy rates. Those measures have strengthened the expansionary stance of monetary policy and indicated that the ECB would keep interest rates as low as possible for an extended period of time, decreasing the level of future interest rates.

Regarding the effect of other non-standard measures beyond the OIS rate, the sign of the parameters $\widehat{\gamma_k^u}$ is expected to be negative. In that case, a rise in the amount of assets purchases or in lending to MFI indicates that monetary policy becomes more expansionary and should lead to a decrease of retail banking interest rates through a reduction in the risk and/or term premia. CBPP and liquidity operations – measured by lending to MFI – have a significant and negative impact whereas the SMP and the APP are not significant and may even exhibit a positive impact for the interest rates on housing loans, consumptions loans and deposit rates to NFC. The results for the CBPP and liquidity indicate that they have been effective in reducing retail interest rates through a reduction in the risk and liquidity premia. The effect of the CBPP is significant for all markets whereas lending to MFI is only significant for the interest rates applied to house purchases and NFC below 1 million €. It may be noticed that both measures – CBPP and liquidity operation – have been notably targeted to banks. Covered bonds are indeed securities issued by banks and backed by loans. They have improved the liquidity of banks funding and consequently the default risk in the banking system has decreased.

We assess the robustness of these results in several ways. First, the transmission channel of monetary policy illustrated by equations (2) to (4) relies on the transmission of the policy decisions on the risk-free rate along the yield curve. The 10-year OIS rate has been used to capture this proxy of future policy rate decisions. The maturity is expected to match the maturity of credits to households and non-financial corporations. We may also consider a shorter horizon to account for shorter credits or for credits granted at variables interest rates. To that end, we have estimated equation (6) with the 5-year OIS rate. Second, in the EA, fiscal policy remains decentralized and there are no common sovereign securities but an average of country-sovereign yields. We use this average measure of yield in the EA instead of the OIS rate. To account for differences in the country-risk we add a control indicator of country fiscal risk, proxied here by the CISS (Composite indicator of systemic risk) index.[16] The results are displayed in Table C in the appendix and show little differences with the baseline estimations. We still find that measures specifically in favour of banks – the CBPP and lending to MFI – have influenced the retail banking interest rates.

3.2 Is the monetary policy transmission different in the periphery?

We assess whether monetary policy during the ELB has been different for peripheral countries since the EA has been fragmented (Reichlin, 2014; Bouvatier and Delatte, 2015). To that end, we disentangle core from peripheral countries. Hence, we estimate equation (6) for these separated panels. The separation between the core and the periphery is determined according to the average of the sovereign spread relative to Germany after May 2009. When the mean spread is below 2 points, the group of core countries is composed of Germany, Finland, the Netherlands, Austria, France, Belgium, and Slovakia. Other countries belong to the periphery.[17]

Results are presented in Table 2. For both sub-samples and each retail market, the error-correction term is significantly negative. The parameter for the 10-year OIS rate is significant for only two out of the six retail markets. In the core countries, the long-term pass-through of interest rates is different from zero for interest rates applied to housing and consumptions loans. In the periphery, the long-term pass-through of interest rates is significant for interest

[16] The CISS is a real-time composite indicator of systemic risk computed by the ECB. For the EA as a whole, it includes several market indicators. A country-indicator is also computed by the ECB. However, it only captures the sovereign stress.
[17] If the cut is set for an averaged spread below 1 point, only Slovakia would switch from the core to the periphery, which does not change our main results has it is shown in robustness.

rates applied to consumptions loans and loans below 1 million € granted to NFC. In those four cases, the pass-through is not complete (below one).

Looking at the effect of assets purchase and liquidity provisions, we still find that only CBPP and lending to MFI would have significantly influenced the retail banking interest rates. However, for the CBPP, results are only significant for 2 out of 6 markets in core countries whereas the effect is significant and associated with a higher coefficient for all markets for peripheral countries. The evidence is also mixed for lending to MFI since it remains significant for 4 markets in the core countries and 1 in the periphery. These results suggest that liquidity provisions were more effective in steering retail interest rates in core countries while CBPP was more useful in peripheral countries

Table 2. The effect of monetary policy decisions in core and peripheral countries

Panel A: Core countries						
Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
10-year OIS	**0.268****	**0.272****	0,119	0,057	**0.199*****	0.099*
	(0.122)	(0.112)	(0.100)	(0.087)	(0.064)	(0.060)
CBPP	**-0.631*****	-0,643	-0,521	-0,506	**-0.774*****	-0,18
	(0.197)	(0.539)	(0.346)	(0.344)	(0.215)	(0.125)
SMP	**0.355***	0,749	-0,153	-0,056	0,003	0.119*
	(0.202)	(0.665)	(0.699)	(0.230)	(0.151)	(0.063)
APP	**0.063****	0,106	0,044	0,062	**0.067*****	**0.027***
	(0.028)	(0.097)	(0.035)	(0.051)	(0.021)	(0.015)
Lending_MFI	**-0.166*****	**-0.697***	-0,22	-0,126	**-0.351*****	**-0.233*****
	(0.030)	(0.381)	(0.266)	(0.104)	(0.104)	(0.050)
Error correction	**-0.561*****	**-0.805*****	**-0.840*****	**-1.393*****	**-0.719*****	**-1.202*****
	(0.120)	(0.124)	(0.222)	(0.274)	(0.093)	(0.216)
Constant	1.528***	5.454**	3,761	4.219*	4.991***	1,701
	(0.567)	(2.408)	(3.565)	(2.502)	(1.686)	(1.138)
N	812	801	812	812	812	812
Log-likelihood	789.241	214.194	545.542	431.514	458.049	540.357
Panel B: Peripheral countries						
Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
10-year OIS	0,01	**0.424***	**0.162****	0,078	-0,105	-0,209
	(0.069)	(0.224)	(0.073)	(0.154)	(0.156)	(0.128)
CBPP	**-0.622****	**-2.422*****	**-0.786*****	**-0.858***	**-0.929*****	**-0.558*****
	(0.279)	(0.804)	(0.149)	(0.453)	(0.268)	(0.153)
SMP	0,028	-1,044	0,326	0,262	-0,682	0,143
	(0.314)	(0.734)	(0.504)	(0.431)	(0.487)	(0.396)
APP	0,028	**0.191*****	0,013	0,043	-0,034	**0.061***
	(0.036)	(0.065)	(0.019)	(0.070)	(0.068)	(0.032)
Lending_MFI	-0,053	-0,732	**-0.401*****	-0,235	0,121	0,081
	(0.067)	(0.880)	(0.140)	(0.264)	(0.256)	(0.140)
Error correction	**-0.923*****	**-1.094*****	**-0.945*****	**-1.473*****	**-0.537*****	**-0.941*****
	(0.212)	(0.265)	(0.147)	(0.230)	(0.151)	(0.174)
Constant	6.593**	23.570***	8.037**	9.957***	2.080**	2,402
	(3.197)	(8.865)	(3.214)	(3.473)	(0.920)	(1.621)
N	928	918	928	927	928	927
Log-likelihood	636.317	60.974	322.52	46.01	823.586	638.242

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. Each column corresponds to the estimation of equation (6) using the mean-group estimator. Six retail banking interest rates are explained on a panel of peripheral Area Countries over the sample 2009m5-2018m12. Core: AT, BE, DE, FR, FI, NL, SK. Periphery: ES, GR, IE, IT, PT, CY, LT, SI. For sake of parsimony, we do not show the estimates of the controls and of the lags of the unconventional measures in the short-term dynamics.

These results are confirmed whether we slightly modify the composition of the panel of both core – excluding Slovakia- and peripheral countries – only keeping Spain, Greece, Ireland, Italy and Portugal- (Table D in the appendix) or if we assess their robustness using 5-year OIS rate or the EA sovereign interest rate instead of the 10-year OIS rate (Tables E and F in the appendix). The evidence suggest that the measures implemented by the ECB during the ELB period would have been effective both in core and peripheral countries, but that different tools and channels were at work. The period was characterized by higher interest rate premia in the periphery. Our results indicate that in those countries, CBPP helped mitigate those risks and influence retail interest rates.

4. Conclusion

This article investigates whether the ECB's ability to influence retail-banking interest rates is annihilated when the policy rate reaches the ELB. As the pass-through of the policy rate usually plays a crucial role for the transmission of monetary policy, the central bank may lose its ability to influence final demand. To circumvent those limits, the ECB has considered several non-standard measures. It has provided ample liquidity to banks in the EA and it has implemented an asset purchase policy. While there is a large body of evidence that unconventional measures have significant effect on asset prices and sovereign yields, empirical analysis on the interest rates applied by banks for households and non-financial corporations is much more limited whereas it plays a crucial role in the transmission of monetary policy in the EA. To that end, we estimate panel-ECM equations where we account for potential heterogeneity in the transmission process of monetary policy.

Our findings suggest that monetary policy has still been effective and that the interest-rate pass-through continued to operate even when the ELB was reached. The transmission of non-standard measures is related to their effect on expectations of future rate, but it also goes beyond. Our results indicate that liquidity provisions and the CBPP have also helped to reduce the retail rate beyond their effect on future policy rates. It suggests that the transmission of those measures stem from a reduction in the term, risk and liquidity premia.

Those measures were also taken during a period characterized by more dispersion in the retail interest rates set by banks. The financial and sovereign debt crises have impaired the transmission of monetary policy notably in the peripheral countries. Consequently, we also disentangle the effect of monetary policy in the core from the peripheral countries by estimating separate equations for the two groups. Our estimations suggest that unconventional measures were powerful in core and peripheral countries but not in a homogenous way. Liquidity provisions were mostly useful to steer retail interest rates in core countries while in peripheral ones it was the CBPP.

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APPENDIX

Table A. Data description

Variable	Source
Housing loans	ECB
Consumptions loans	ECB, De Nederlandsche Bank
Loans to Non-financial corporations below € 1M	ECB
Loans to Non-financial corporations over € 1M	ECB, National Bank of Belgium
Households' deposits	ECB, Bank of Greece and De Nederlandsche
NFC depostits	ECB, Bank of Greece and De Nederlandsche
Sovereign yield	ECB
10-year OIS rate	Thomson Reuters Eikon
5-year OIS rate	Thomson Reuters Eikon
CISS	ECB
Consumer price inflation	Eurostat
VIX	Thomson Reuters Eikon

Table B. Cointegration analysis – Westerlund (2007) test

	G-tau	p-value	P-tau	p-value	Lags
Housing loans - OIS10Y	**-2.57**	**0.00**	**-8.94**	**0.00**	4.1
Consumption - OIS10Y	**-2.43**	**0.00**	**-10.69**	**0.00**	3.7
NFCb - OIS10Y	**-2.46**	**0.00**	**-7.25**	**0.07**	4.2
snfo - OIS10Y	**-2.68**	**0.00**	**-7.29**	**0.06**	4.7
dephh - OIS10Y	**-3.09**	**0.00**	**-10.4**	**0.00**	3.6
depnfc - OIS10Y	**-2.81**	**0.00**	**-8.82**	**0.00**	4.7

The Westerlund approach consists in testing $\alpha_j = 0$, corresponding to the null hypothesis of no cointegration. Two alternative hypotheses are considered. For the group-mean test, the alternative is $\alpha_j < 0$ for at least one (j), and for the panel test, the alternative is $\alpha_j < 0$ for all (j). For each alternative hypothesis, Westerlund (2007) computes two statistics G_α / G_τ and P_α / P_τ for the group-mean statistics and the panel statistics respectively. The cointegration test is performed without including a deterministic trend.[18]

[18] The results with a deterministic trend are not presented here but available from the authors.

Table C. Robustness – Euro Area Countries

Panel A. 5-Year OIS instead of 10-Year OIS

Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
5-year OIS	0.175	**0.606****	**0.287***	-0.052	-0.066	-0.101
	(0.128)	(0.250)	(0.152)	(0.152)	(0.184)	(0.101)
CBPP	**-0.687****	**-1.264*****	-0.332	**-0.948****	**-1.223****	**-0.446*****
	(0.274)	(0.452)	(0.211)	(0.427)	(0.532)	(0.128)
SMP	0.203	0.216	0.211	-0.074	-1.012	0.066
	(0.248)	(0.440)	(0.302)	(0.235)	(0.977)	(0.181)
APP	**0.064***	**0.143****	0.001	0.081	-0.028	**0.046****
	(0.035)	(0.059)	(0.017)	(0.058)	(0.080)	(0.019)
Lending_MFI	**-0.133****	-0.737	**-0.375*****	-0.110	0.076	-0.028
	(0.056)	(0.543)	(0.143)	(0.156)	(0.287)	(0.096)
Error correction	**-0.803*****	**-1.016*****	**-0.989*****	**-1.378*****	**-0.647*****	**-1.048*****
	(0.169)	(0.162)	(0.155)	(0.173)	(0.092)	(0.137)
Constant	**4.679****	**14.030*****	**5.758****	**7.731*****	**3.132*****	**2.043****
	(2.051)	(5.410)	(2.291)	(2.028)	(0.886)	(1.004)
N	1739	1719	1739	1739	1740	1739
Log-likelihood	1424.631	277.855	898.134	469.428	1271.407	1172.652

Panel B. Euro Area sovereign interest rate instead of 10-Year OIS

Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
Sovereign EA	**0.216*****	**0.492*****	**0.139***	**0.203****	0.036	0.007
	(0.080)	(0.172)	(0.074)	(0.089)	(0.083)	(0.050)
CBPP	**-0.465****	**-1.197*****	**-0.799*****	**-0.475****	**-0.828*****	-0.250
	(0.199)	(0.432)	(0.219)	(0.206)	(0.141)	(0.159)
SMP	0.281	-0.621	-0.118	0.186	-0.340*	0.197
	(0.213)	(0.726)	(0.483)	(0.271)	(0.197)	(0.313)
APP	0.027	0.062	**0.047****	0.028	0.017	0.030***
	(0.027)	(0.092)	(0.023)	(0.031)	(0.046)	(0.011)
Lending_MFI	-0.020	-0.943	**-0.351****	**-0.244***	-0.102	-0.135*
	(0.092)	(0.575)	(0.156)	(0.142)	(0.127)	(0.075)
Error correction	**-0.716*****	**-0.934*****	**-0.890*****	**-1.596*****	**-0.570*****	**-1.015*****
	(0.153)	(0.148)	(0.126)	(0.187)	(0.104)	(0.129)
Constant	**3.710****	**15.545*****	**6.755*****	**7.572*****	**3.120*****	**2.024****
	(1.588)	(4.774)	(2.574)	(2.477)	(0.949)	(0.962)
N	1740	1719	1740	1739	1740	1740
Log-likelihood	1415.744	291.940	872.497	504.714	1283.152	1172.120

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. Each column corresponds to the estimation of equation (6) using the mean-group estimator. Six retail banking interest rates are explained on a panel of 15 EA Countries over the sample 2009m5-2018m12.For sake of parsimony, we do not show the estimates of the controls and of the lags of the unconventional measures in the short-term dynamics.

Table D. Robustness – Alternative compositions

Panel A. Alternative composition-Core countries

Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
10-year OIS	**0.236***	**0.314****	0.134	-0.026	**0.172****	0.104
	(0.140)	(0.123)	(0.116)	(0.031)	(0.068)	(0.070)
CBPP	**-0.669*****	-0.227	-0.604	-0.531	**-0.646*****	-0.196
	(0.229)	(0.404)	(0.398)	(0.406)	(0.204)	(0.146)
SMP	0.174	0.186	-0.323	-0.033	**0.147*****	0.115
	(0.106)	(0.416)	(0.802)	(0.271)	(0.050)	(0.074)
APP	0.075**	0.024	0.051	0.058	0.064**	0.032*
	(0.029)	(0.059)	(0.040)	(0.060)	(0.025)	(0.017)
Lending_MFI	**-0.140*****	**-0.344****	-0.331	-0.045	**-0.284*****	**-0.264*****
	(0.019)	(0.168)	(0.286)	(0.077)	(0.095)	(0.045)
Error correction	**-0.533*****	**-0.871*****	**-0.660*****	**-1.294*****	**-0.706*****	**-1.119*****
	(0.138)	(0.125)	(0.155)	(0.302)	(0.109)	(0.236)
Constant	**1.863*****	**4.893***	5.517	2.339	**3.538*****	1.927
	(0.541)	(2.771)	(3.671)	(1.954)	(1.011)	(1.320)
N	696	696	696	696	696	696
Log-likelihood	718.685	205.043	523.707	424.350	421.631	446.313

Panel B. Alternative composition-Peripheral countries

Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
10-year OIS	-0.034	0.393	0.158	0.072	0.065	-0.149
	(0.070)	(0.287)	(0.108)	(0.133)	(0.084)	(0.168)
CBPP	**-0.830*****	**-1.460***	**-0.740*****	-0.616	**-0.683*****	**-0.683*****
	(0.297)	(0.756)	(0.240)	(0.596)	(0.174)	(0.205)
SMP	-0.064	-0.137	0.755*	0.369	-0.111	-0.284
	(0.417)	(0.677)	(0.429)	(0.433)	(0.130)	(0.212)
APP	0.056	**0.181***	**0.042****	0.018	**0.022****	0.045
	(0.042)	(0.106)	(0.019)	(0.093)	(0.010)	(0.031)
Lending_MFI	**-0.106*****	0.035	**-0.478*****	-0.282	-0.178	-0.080
	(0.034)	(0.327)	(0.185)	(0.334)	(0.121)	(0.122)
Error correction	**-1.097*****	**-1.351*****	**-0.891*****	**-1.383*****	**-0.675*****	**-0.974*****
	(0.317)	(0.371)	(0.195)	(0.356)	(0.189)	(0.229)
Constant	**9.532****	**15.458****	7.683	**6.624***	**3.002*****	**4.470*****
	(4.772)	(6.191)	(5.229)	(3.692)	(0.729)	(1.715)
N	580	580	580	580	580	580
Log-likelihood	389.775	43.125	223.023	111.095	536.305	435.365

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Each column corresponds to the estimation of equation (6) using the mean-group estimator. Six retail banking interest rates are explained on a panel of 15 Euro Area Countries over the sample 2009m5-2018m12. Core: AT, BE, DE, FR, FI, N. Periphery: ES, GR, IE, IT, PT. For sake of parsimony, we do not show the estimates of the controls and of the lags of the unconventional measures in the short-term dynamics.

Table E. Robustness – Core Countries

Panel A. 5-Year OIS instead of 10-Year OIS

Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
5-year OIS	**0.364****	**0.403*****	0.137	0.051	**0.258*****	0.088
	(0.183)	(0.133)	(0.144)	(0.106)	(0.064)	(0.074)
CBPP	-0.670**	-0.418	-0.462	-0.515	**-0.653*****	-0.241
	(0.340)	(0.563)	(0.305)	(0.357)	(0.228)	(0.158)
SMP	0.445	0.972	-0.047	-0.064	0.129	-0.029
	(0.294)	(0.689)	(0.631)	(0.239)	(0.113)	(0.120)
APP	**0.091****	0.094	0.039	0.068	**0.060****	0.026
	(0.044)	(0.105)	(0.031)	(0.050)	(0.028)	(0.019)
Lending_MFI	**-0.217*****	**-0.729***	-0.194	-0.129	**-0.350*****	**-0.261*****
	(0.071)	(0.439)	(0.270)	(0.084)	(0.086)	(0.072)
Error correction	**-0.428*****	**-0.827*****	**-0.828*****	**-1.223*****	**-0.729*****	**-1.084*****
	(0.120)	(0.134)	(0.229)	(0.241)	(0.106)	(0.255)
Constant	1.153	3.960	3.210	2.899*	**4.109*****	**1.930***
	(0.759)	(2.866)	(3.652)	(1.654)	(1.407)	(1.023)
N	812	801	812	812	812	812
Log-likelihood	758.967	215.531	540.651	424.048	455.453	524.174

Panel B. Euro Area sovereign interest rate instead of 10-Year OIS

Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
Sovereign EA	**0.393*****	**0.412*****	0.191	0.140	0.125	**0.096***
	(0.126)	(0.129)	(0.144)	(0.099)	(0.109)	(0.055)
CBPP	-0.413	-0.233	-0.503	**-0.305***	**-0.922*****	-0.169
	(0.358)	(0.387)	(0.410)	(0.170)	(0.211)	(0.118)
SMP	**0.534****	0.786	-0.337	0.038	-0.149	0.042
	(0.246)	(0.715)	(0.870)	(0.162)	(0.272)	(0.093)
APP	0.037	0.042	0.039	0.035	**0.085*****	0.018
	(0.053)	(0.059)	(0.040)	(0.026)	(0.022)	(0.013)
Lending_MFI	0.050	-0.705	-0.287	-0.145	**-0.239***	**-0.232*****
	(0.173)	(0.441)	(0.318)	(0.131)	(0.142)	(0.044)
Error correction	**-0.587****	**-0.787*****	**-0.821*****	**-1.773*****	**-0.595*****	**-1.229*****
	(0.254)	(0.123)	(0.238)	(0.330)	(0.094)	(0.216)
Constant	**1.534***	**4.912***	3.764	**4.814***	**4.027****	**1.998***
	(0.822)	(2.698)	(3.877)	(2.711)	(1.609)	(1.204)
N	812	801	812	812	812	812
Log-likelihood	782.335	220.324	545.220	458.561	460.465	536.523

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. Each column corresponds to the estimation of equation (6) using the mean-group estimator proposed by Pesaran et al. (1999). Six retail banking interest rates are explained on a panel of 15 Euro Area Countries over the sample 2009m5-2018m12. Core: AT, BE, DE, FR, FI, NL, SK. For sake of parsimony, we do not show the estimates of the controls and of the lags of the unconventional measures in the short-term dynamics.

Table F. Robustness – Peripheral Countries

Panel A. 5-Year OIS instead of 10-Year OIS

Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
5-year OIS	-0.001	**0.784***	**0.228***	-0.142	-0.349	-0.232
	(0.088)	(0.459)	(0.137)	(0.274)	(0.315)	(0.149)
CBPP	**-0.681****	**-2.004*****	**-0.646*****	**-1.327***	**-1.722***	**-0.636*****
	(0.293)	(0.600)	(0.193)	(0.738)	(0.972)	(0.168)
SMP	0.011	-0.445	0.426	-0.084	-2.011	0.084
	(0.305)	(0.486)	(0.420)	(0.405)	(1.808)	(0.326)
APP	0.035	**0.185*****	-0.002	0.093	-0.105	0.059**
	(0.037)	(0.066)	(0.026)	(0.104)	(0.148)	(0.029)
Lending_MFI	-0.035	-0.745	**-0.406*****	-0.092	0.450	0.144
	(0.059)	(0.980)	(0.155)	(0.292)	(0.510)	(0.149)
Error correction	**-1.065*****	**-1.181*****	**-0.971*****	**-1.514*****	**-0.576*****	**-0.870*****
	(0.216)	(0.276)	(0.148)	(0.251)	(0.148)	(0.116)
Constant	**7.432****	**22.842****	**7.700****	**11.959*****	**2.277****	2.154
	(3.314)	(8.935)	(3.001)	(2.809)	(1.112)	(1.592)
N	928	918	928	927	928	928
Log-likelihood	639.548	62.324	319.435	45.380	815.954	624.725

Panel B. Euro Area sovereign interest rate instead of 10-Year OIS

Retail interest rates	Housing loans	Consumption loans	NFC loans < 1 M, €	NFC loans > 1 M, €	Households deposits	NFC deposits
Sovereign EA	0.061	**0.562***	0.094	**0.259***	-0.042	-0.071
	(0.069)	(0.312)	(0.068)	(0.147)	(0.124)	(0.073)
CBPP	**-0.510****	**-2.040*****	**-1.058*****	**-0.625***	**-0.745*****	-0.321
	(0.227)	(0.609)	(0.183)	(0.362)	(0.198)	(0.287)
SMP	0.060	**-1.852***	0.073	0.316	**-0.508***	0.332
	(0.332)	(1.063)	(0.544)	(0.501)	(0.284)	(0.595)
APP	0.017	0.080	0.053*	0.023	-0.043	**0.040****
	(0.026)	(0.170)	(0.028)	(0.055)	(0.080)	(0.017)
Lending_MFI	-0.081	-1.152	**-0.408*****	-0.331	0.019	-0.049
	(0.091)	(1.039)	(0.123)	(0.246)	(0.202)	(0.133)
Error correction	**-0.828*****	**-1.062*****	**-0.950*****	**-1.441*****	**-0.549*****	**-0.828*****
	(0.188)	(0.257)	(0.126)	(0.205)	(0.183)	(0.131)
Constant	**5.613****	**24.849*****	**9.373*****	**9.986****	**2.327****	2.047
	(2.801)	(7.315)	(3.386)	(3.963)	(1.115)	(1.544)
N	928	918	928	927	928	928
Log-likelihood	633.410	71.615	327.278	46.153	822.686	635.597

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. Each column corresponds to the estimation of equation (6) using the mean-group estimator. Six retail banking interest rates are explained on a panel of 15 Euro Area Countries over the sample 2009m5-2018m12. Periphery: ES, GR, IE, IT, PT, CY, LT, SI. For sake of parsimony, we do not show the estimates of the controls and of the lags of the unconventional measures in the short-term dynamics.