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Possible Impact of the ECB's Outright Purchase Programmes on Economic Growth from Individual Eurozone Countries' Point of View

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Abstract. The third wave of ECB's quantitative easing aims to, among others, support impaired credit provisioning by banking system to real economy. This paper we examine relationship between credit provisioning and economic output in EA member states with ARDL bound test estimated by OLS. Contrary to most of the recent studies we test significance of causal relationship running from credit to domestic output on individual country levels and not for the entire euro area. Our results suggest that in most of the member states the economic growth precedes credit provisioning, a fact that might hinder efforts to support economic recovery through banking channel. In the post-2008 period only four countries show signs of positive impact of increase in bank credit on economic output, namely Austria, France, Germany and Malta.

Keywords: bank credit, quantitative easing, ARDL

1 Introduction

Weak economic growth, high unemployment and persisting problems in public finance accompanied by low inflation have led the European Central Bank (ECB hereinafter) to serious change in monetary policy orientation. As a response to sluggish increase in price level across Europe reaching 0.3% last August spurred by fears of threatening deflation the ECB has decided to adopt a more aggressive approach to monetary easing. Decrease in key policy interest rate to technical zero levels (0.05% for main refinancing operations), adoption of enhanced targeted long term refinancing operations (TLTRO) for up to 4 years period, introduction of the extensive quantitative easing policy (Extended Asset Purchase Programme, EAPP hereinafter) represent four measures that should finally ignite fires of inflation. Officially, these measures are intended to improve functioning of impaired monetary transmission mechanism, support the credit provision by banking system to real economy and contribute to accommodating stance of monetary policy (ECB, 2014).

Even despite the 5-year history of unconventionally monetary policy, loan provision growth rate has stayed in red numbers since 2013 with the non-financial corporations sector as a main contributor to this negative evolution. Thus, even though the price of loans (nominal interest rate) has been successfully suppressed to minimum levels the volume of loans provided by the banking sector has been contracting on ongoing basis.

In the first years of financial crisis with its outburst in late 2008 the ECB had been reluctant to accompany Federal Reserve (FED) or Bank of England (BoE) in their quantitative easing policies but rather drew its attention to ensure friction-less access to liquidity for commercial banking sector (Enhanced Credit Support). The initial introduction of Security Markets Program (SMP) replaced by Outright Monetary Transactions (OMT) had spurred a passionate discussion even despite the fact that these programs did not work as the "true" quantitative easing (QE hereinafter). The aim of all those

special programs was to temporarily lift the pressure on short to medium term interest rates of bonds of those countries whose prices seemed to be detached from the fundamentals due to rising panic in the financial markets. The full amount of the SMP program has been sterilized to avoid impact on liquidity conditions (and possible inflationary pressures at that time) and could not be taken as one form of the quantitative easing monetary policy.

Introduction of the first wave of the Covered Bond Purchased Program indicated a first change in the ECB policy stepping into world of outright purchases thus increasing the monetary base for theoretically indefinite period (in reality up to the maturity). Yet, the money allocated to the CBP program was so small (60 bill. EUR) that the impact of this measure on change in money supply, price of money and consequently amount of borrowing to the real sector had been questioned. The second wave in 2011 was even smaller in its absolute size (40 bill.) and could be considered more a cosmetic adjustment that a real step into the world of QE. The third wave effectively put into place in October 2014 has been expected to be of much larger scale than its two predecessor with final amount surpassing 1 trillion euros.

The theoretical and empirical literature provides list of various channels through which QE with credit easing as its part might affect real economic conditions and achieve aforementioned desired effects. Not surprisingly, most of the literature focuses on analysis of effects of pure QE using purchase of public securities on economy of the United States (e.g. Baumeister and Benati, 2009; Hamilton and Wu, 2012 and others) or the United Kingdom (Joyce et al., 2011; D'Amico and King, 2013 and others) through decrease in long-term interest rate.

Second group of studies estimates direct impact of QE on economic growth (positive) and inflation (positive) again in the United States (Baumeister and Benati, 2009; Krishnamurthy and Vissing-Jorgensen, 2011 among others). Only a handful of studies have been so far focusing on euro area by either estimating an impact of the Enhanced Credit Support (e.g. Lenza et al., 2010) or SMP (e.g. Eser and Schwab, 2013) on long-term public sector interest rates or real economic growth and inflation. Bridges and Thomas (2012) take a monetarist approach to the Bank of England's outright purchases and find that direct purchases of securities from the hands on non-bank private sector led to increase in money supply, and consequently output and inflation. Beirne et al. (2011) investigates impact of CBPP1 on CB market arriving to the conclusion that this program led to increase in supply of CBs, revival of secondary CB market and decrease in market spread.

As the credit provisioning is considered to play an important role in the economic recovery of the euro area (EA) countries, this wave of quantitative easing is expected to (indirectly) persuade banking sector to increase credit volume flowing to the households and non-bank corporations to increase their spending and investments. This objective, however, implicitly assumes that bank credit somehow precedes economic growth. While it might be true that bank credit fuels economic activity the question of causal relationship inevitably arises. Our research aims to contribute to the recent literature by investigating direction and strength of the bank credit and economic output relationship on the individual country level in a unified way. By investigating the link between credit and output in pre-crisis and crisis period we show that while in the pre-crisis period credit in general follows economic activity, some of the member states (Germany, France, Austria, Malta) might have been successful to support economic recovery through bank credit provisioning.

Regarding the structure of this paper, in the second chapter we shortly discuss theoretical role of banks in the current monetary transmission mechanism. Third chapter describe data sample and ARDL model used for cointegration estimation. Results from correlation analysis and ARDL estimations are discussed in the chapter four. Chapter five concludes.

2 Theoretical underpinnings

The effects of direct asset purchases might have various effects on financial markets, banking sector and real economy. The current literature focuses its attention on the effects of direct assets purchases on long-term interest rates and effect of change in long-term interest rate on real macroeconomic variables (Neo-Keynesian view). However, those are not the only possible effects of the outright asset purchases. Increase in money provision through base money (not targeting money supply) might affect credit provisioning through banking intermediary function and might lead to increase in domestic consumption and investment (Monetaristic view). Additionally, outright purchase of assets might be as well used as a tool for pumping the liquidity into the inter-bank sector in times of financial distress.

Link between changes in short-term and long-term interest rate and their effects on real economic variables is captured by the standard monetary transmission mechanism of inflation targeting (Bernanke and Gertler's 'black box' of monetary transmission mechanism, Bernanke and Gertler, 1995). As the literature dealing with the technicalities of the monetary transmission mechanism is wide and broad we do not discuss it in a more detailed way but rather focus on specific channels of monetary transmission mechanism that deal with the role of credit provisioning by banking sector.

2.1 Credit provisioning in monetary transmission mechanism

In standard literature on monetary transmission mechanism (Mishkin, 1996) the interest rate channel predicts reaction in investment decisions by companies or households due to the changing costs of capital (captured by real long-term interest rate). However, the discussion on real conduct of these changes is often missing. In reality, economic agents might react in two possible ways to changing costs of capital: a) restrict or extend their investment plans and finance their decision from internal sources due to the realization that overall costs of capital in economy have changed; b) restrict or extend their investment plans and finance their decisions from external sources – via intermediate bank sector or via financial markets. In general, monetary policy may have an impact on both aggregate demand side and supply side by influencing the credit provisioning through banking sector.
The bank lending channel usually focuses on the means by which monetary policy affects aggregate demand via credit supply of intermediary institutions (Bernanke and Gertler, 1995 and others). By changing the costs of borrowing for banking institutions (liability side) central bank directly influences interest spread (lending-deposit interest rates) that represent key source of profit for most of the traditional deposit-oriented banking institutions. In theory, commercial banks are likely to respond to decreasing costs of borrowing (i.e. increasing interest spread) by increase in credit provisioning and decrease in lending interest rates. Demand side of the economy is therefore stimulated by higher *consumption* spending by domestic private agents (households or government).

The bank channel of monetary policy may affect the aggregate supply side through credit-cost channel (CCC), meaning that the lending bank interest rate enters cost function of firms in the economy. By changing the funding costs available through bank credit to domestic firms overall domestic production (investment decisions) might be positively or negatively affected. The effect on supply side of the economy is the greater the higher the importance of bank credit in the domestic economy.

The costs of capital channel transmitted through *financial markets* is a straightforward one and can be directly derived from link between short term policy rate and long-term real interest rate described in the previous section of this paper assuming price stickiness (i.e. slow adjustment in price level, expected inflation rate does not change in short- to medium-term). Costs of firms' external borrowing through debt markets lower due to the positive shock to the long-term interest rate (decrease) and firms respond to it by increasing their overall investments and vice versa.

The balance sheet channel, also known as the "financial accelerator" or "broad (credit) channel", focuses on "the potential impact of changes in monetary policy on borrowers' balance sheets and income statements, including variables such as borrowers' net worth, cash flow and liquid assets" (Bernanke and Gertler, 1995).

Firstly, a negative shock to interest rate adversely affects borrowers' asset value through changing market prices of equity, bonds and real-estates which indirectly influences net wealth. Secondly, an increase in interest rates works to increase the payments that the firm must make to service its floating rate debt, thus effectively increasing firm's costs of capital and decreasing incentive to invest. An indirect effect arises, too, when the same increase in interest rates works to reduce the capitalized value of the firm's long-lived assets. Second-round effects might comprise fall in households' consumption and spending that transmits into firm's revenue fall leading to a decrease in net wealth as a function of rigidities on the costs side. As the investor's balance sheet value and creditworthiness deteriorates due to increase in policy rate, a change in net worth affects the borrower's ability to obtain loans (or other sources of external financing) for further investment and consumption. A reduction of net worth increases adverse selection and moral hazard, since borrowers with low net worth have an incentive to take greater risks.

In Europe, the preferred form of financing is bank loan (Darvas, 2013). Drehmann (2013) argues that the loan boom had preceded financial crisis, in general and credit-to-gdp ratio is superior early warning indicator of banking crisis. On the other hand, Takáts and Upper (2013) confirm that after the crises the loans to private sector and the economic growth are not correlated any more. Biggs et al. (2010) argue, that it is important to distinguish between credit level and credit flow in relation to economic recovery, because new credit are formed in close relationship with economic activity in the period of economic recovery.

3 Dataset description and ARDL bound test

Our dataset includes 17 euro area member states, two variables (credit to households and non-financial corporations,[1] nominal GDP) of the euro area for various periods as available from the ECB database on quarterly basis in millions of EUR.

The Autoregressive Distributed Lag (ARDL) bounds testing approach was developed by Pesaran and Shin (1996), Pesaran and Smith (1998) and Pesaran et al. (2001). The ARDL bounds approach has three main advantages over the widely used Engle-Granger two-step approach and Johansen's regression method: i) cointegration can be carried out even if variables are I(0), I(1) or mutually cointegrated (Pesaran and Shin, 1996; Pesaran and Smith, 1998); ii) cointegration is possible even if independent variables are endogeneous as the model makes the endogeneity bias insignificant in size and relevant, therefore providing accurate long-run parameters and valid t-values (Ang, 2008a; Inder, 1993); iii) the model is especially relevant for small samples as it provides estimates of short-run dynamics consistent with long-run parameters (Ang, 2008b).

The ARDL-bounds test proceeds in two steps. First, the optimal number of lags for the first difference of variables is verified by Schwarz Bayesian Criterion (SBC) because it tends to define more parsimonious specification (Pesaran and Shin, 1998) and performs well in small data samples. As the optimal number of lags is fundamental to eliminate any endogeneity problems (Pesaran and Shin, 1998) we test for autocorrelation in residuals by Breusch-Godfrey LM test up to order 4 after using the

[1] Cyprus (2005q4-2014q4), Estonia (2008q1-2014q4); Malta (2005q1-2014q4); Slovenia (2004q1-2014q4), Slovakia (2006q1-2014q4); Latvia (2010q3-2014q4); Lithuania (2010q2-2014q4); Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain for 2003q1-2014q4.

number of lags as recommended by SBC. If the null hypothesis of no autocorrelation is rejected we add so many lags until no autocorrelation in residuals is present.

The second step consists of checking for existence of cointegration between dependent and independent variables. Firstly, the error correction coefficient must be negative, which indicates that the exogenous variable returns to its long-term equilibrium value. The validity of cointegration estimates is compared against the critical values derived in Pesaran et al. (2001). In case of a small sample with less than 80 observations per variable, which is the case in this paper, critical values are taken from Narayan (2005). Residuals from the model are estimated with heteroscedasticity robust standard errors and tested for normality of distribution and autoregressive conditional heteroscedasticity (ARCH) test.

4 Empirical results

Relationship between credit and economic growth is a complex one and the literature has not yet provided a definite answer whether the causal relationship runs from credit to economic growth, or economic growth determines credit cycle or the relationship is a mutually reinforcing one, as many economic phenomenon are. In order for the ECB's extraordinary measures to positively influence economic conditions through increase in credit provisioning in member states it is necessary that banking channel in the monetary transmission mechanism is working properly. In other words, even in presence of substantial decrease in long-term interest rate without increase in spending and investments supported by credit expansion the economic recovery remains only a wishful thinking.

4.1. Correlation analysis

In line with Kress (2004), Lakstutiene et al. (2011) and Beka (2015) we firstly investigate possible direction of casual relationship between nominal GDP and overall credit to non-bank institutions and households.

As during the period analyzed (2003q1-2014q4) all of the countries have been seriously affected by the outburst of financial and subsequently financial crisis, we focus separately on analysis of pre-crisis and post-crisis period aside from the analysis of the entire sample. From the results of the correlation coefficients calculated using quarterly data (Appendix 1) one could arrive to the following interesting remarks.

In practically all countries analyzed, pre-crisis relationship between credit volume and nominal GDP shows a strong uni-directional nature running from nominal GDP to credit volume with correlation coefficients fluctuating around 0.90 and more. Once the credit volume starts serving as a lead variable (from model 10 onwards in the sub-plots) the value of correlation coefficients deteriorates to zero after four to eight quarters in most of the member states. On top of that, the deterioration in correlation coefficients usually starts one to four quarters in the past suggesting that credit responds to economic growth with a lag of one to four quarters.

While the pre-crisis period delivers a remarkably uniform behavior across countries, post-2008 period provides an interesting insight into the diverse nature of reaction of nominal GDP to change in credit provisioning. Heterogeneity of the sample divides member states into four distinct groups.

Firstly, we have a group of member states for which the direction of relationship between credit and nominal GDP known from the pre-crisis period remains unaffected (Belgium, Germany, Ireland, Portugal, Slovenia, Spain) even if the strength of the connection could have been severely hit resulting

in a lower absolute values of the correlation coefficients. Second group of countries provides a tentative evidence that direction of casual relationship between credit and nominal GDP might change under specific circumstances. For Austria, France, Malta and Slovakia all belong to countries where positive shock into increase in credit provisioning has been able to stimulate economic growth and, thus, might have served as a tool to put in motion process of economic recovery in the post-2008 period.

Adverse consequences of unsustainable credit growth coupled with strong post-crisis deleveraging processes on economic growth are captured in the third group of member states. Ireland, Estonia and Luxembourg achieve highest negative correlation coefficients in the second segment of their respective subplots. For these member states, decrease in credit provisioning is likely to be accompanied with increase in nominal GDP during this period, and vice versa. Finland, Italy and partially Netherlands also show signs of a negative link between credit provisioning and economic growth, however strength of relationship between banking sector and real economy for these countries is somewhat less emphasized (regions close to zero correlation coefficients). As the time series available for Latvia and Lithuania from the ECB official database are very short the high inverse correlation for both countries should be taken with enough grain of salt. Cyprus and Greece represent a very special cases as both of this countries experienced severe banking and, in the latter case, economic crisis scale of which is hardly comparable to any of the other member states included into the sample. From this reason, negative correlation coefficients acquired in the second segment of their subplots (models 10-18) pointing to the causal link from credit-to-GDP reflects are hard to interpret without a more detailed analysis.

4.2. Credit and GDP causal relationship by ARDL model

In order to confirm or reject hypothesis of possibility to fuel economic recovery through credit provisioning in individual member states we utilized a formal ARDL model as described in the Section 3. In order to capture possible time lags in transmission between financial and real sector of economy we test causal relationship between credit provisioning and nominal GDP with a lag of three quarters. Before the estimation of the ARDL models by OLS we test for presence of unit root tests by Augmented Dickey-Fuller and Phillips-Perron tests. Results summarized in the Appendix XXX suggest that handful of countries should be excluded from our analysis as either credit or nominal GDP are not I(1) or I(0) process, namely Cyprus, Italy, Portugal, Slovakia, Slovenia and Spain. The unit-root test is conducted on period 2008q1-2014q4 for credit volume and 2009q1-2014q4 for nominal GDP as the presence of long-term cointegration is tested with a lagged credit volume of three quarters. Residuals from the models were tested for presence of autocorrelation, heteroscedasticity and normality. In majority of cases models show good properties with respect to possible biases stemming from presence of autocorrelation, heteroscedasticity and non-normality.

As already hinted in the correlation analysis outcome, there are countries in our sample for which increase in credit provisioning has been likely to cause increase in nominal GDP during the period analyzed. Not surprisingly, among these countries are listed member states such as Austria, France, Germany and Malta. In general, increase of credit volume in one percent might have brought about increase in nominal GDP of about 0.5 percent. Germany poses a single exception with an extreme long run multiplier value of 3.5 measuring the level of nominal GDP elasticity with respect to credit volume to private companies and households. On the other side of the scale sits Greece and Ireland for which the coefficient for long-term relationship between credit and nominal GDP is significant and negative varying from -0.7 (Greece) to -0.2 (Ireland). As discussed in the previous section, this outcome is likely to reflect significant de-leveraging process in the banking sector that took place

during the period analyzed (Ireland) and severely distorted functioning of the overall banking sector due to the debt crisis in the case of Greece. [2]

Rest of the countries included into our sample do not show a statistically significant causal long-term cointegration relationship between nominal GDP and lagged credit volume serving as a primary causal determinant. Taking into account the pre-2008 behavior it might be concluded that in most of the EA countries the credit provisioning is likely to follow economic cycle rather than to fuel it directly. The widely accepted important role of banking channel of the monetary policy might be therefore put into question once discussing possible sources of economic recovery within the Eurozone area. As pointed out by Bijsterbosch and Dahlhaus (2011), sometimes the economic recovery is not accompanied by a pick-up in lending, a phenomenon called credit-less recovery. New credit, thus, might not be a necessary condition for output to recover. Even though the Phoenix Miracles (Calvo et al., 2006) has been documented predominantly for developing countries (Calvo et al., 2006; Bijsterbosch and Dahlhaus, 2011) possible presence of credit-less recovery should not be easily ruled out even for advanced all EA economies. A more detailed analysis of the four countries (Germany, Austria, France and Malta) should therefore become subject to further studies in order to specify why channeling the money through bank credit seems to be successfully working in their specific cases and for this specific period of time.

5 Conclusions

One of the objectives of ECB unconventional monetary policy, with third wave of quantitative easing announced in 2014 included, is to create favorable conditions for increase in credit provisioning into real economy. With an effective zero lower bound restriction on key policy rate, substantial increase in monetary base should be translated into decrease in long-term interest rate and increase in bank credit. As the credit provisioning is considered to play an important role in the economic recovery of the euro area (EA) countries, this wave of quantitative easing is expected to, among others, persuade banking sector to increase credit volume flowing to the households and non-financial corporations to increase their spending and investments. This objective, however, implicitly assumes that bank credit somehow precedes economic growth. While it might be true that bank credit fuels economic activity the question of causal relationship inevitably arises. In this paper we examine relationship between credit provisioning and economic output in EA member states with ARDL bound test estimated by OLS. Contrary to most of the recent studies we test significance of causal relationship running from credit to domestic output on individual country levels and not for the entire euro area. Our results suggest that in most of the member states the economic growth precedes credit provisioning, a fact that might hinder efforts to support economic recovery through banking channel. In the post-2008 period only four countries show signs of positive impact of increase in bank credit on economic output, namely Austria, France, Germany and Malta.

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[2] We estimated ARDL models also for countries that were excluded from the analysis due to the suspicion that the underlying processes are of I(2) nature. As hinted in the correlation analysis, Slovakia belongs to the group of countries for which the positive causal relationship from credit to nominal GDP has been confirmed. Results for Italy support outcomes from correlation analysis and point to the negative link between credit and nominal GDP, along with Slovenia.

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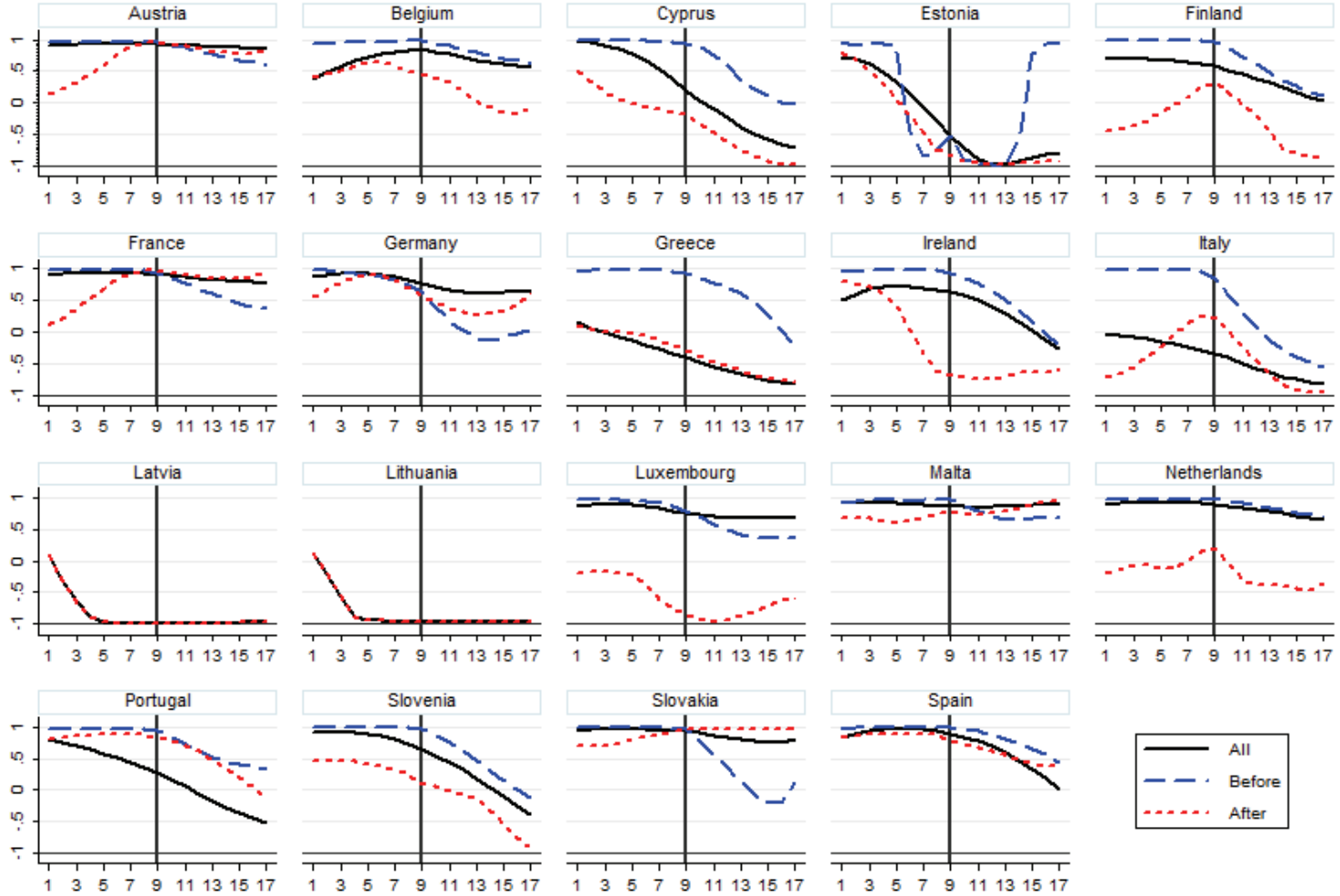
Appendix

Table A1: Correlation between economic output and credit to households and non-financial corporations (correlation coefficients)



Note: Models 1 provides correlation coefficient between credit to households and non-financial corporations and nominal GDP lagged in 8 quarters. Model 2 provides correlation coefficient between credit to households and non-financial corporations and nominal GDP lagged in 7 quarters. All subsequent models follow this pattern. Model 9 gives correlation coefficient between credit to households and non-financial corporations and nominal GDP. Model 10 gives correlation coefficient between credit to household and non-financial corporations and nominal GDP leading 1 quarter. All subsequent models follow this pattern. Models are estimated for 2003q1-2014q4 (all), before period (2003q1-2008q4) and after period (2009q1-2014q4).

Table A2: Unit-root test for credit to households and non-financial corporations and nominal GDP

	Credit (2008q1 - 2014q4)			GDP (2009q1 - 2014q4)		
	ADF		PP	ADF		PP
	levels, constant & trend	first diff	first diff	levels, constant & trend	first diff	first diff
Austria	0.7136	0.1502	**0.0578***	0.9416	**0.0000*****	**0.0000*****
Belgium	0.9435	**0.0473****	**0.0459****	**0.0059*****	**0.0005*****	**0.0116****
Cyprus	0.7022	**0.0202****	0.4660	0.2316	0.4609	0.1708
Estonia	0.9827	**0.0439****	**0.0289****	0.1395	**0.0022*****	**0.0025*****
Finland	0.4878	**0.0475****	**0.0115****	0.7741	0.1451	**0.0002*****
France	0.4380	**0.0128****	**0.0928***	0.9168	0.1790	**0.0025*****
Germany	**0.0597***	**0.0590****	**0.0994***	0.6960	0.2661	**0.0102****
Greece	0.6571	**0.0369****	**0.0356****	1.0000	0.9620	**0.0077*****
Ireland	0.6784	**0.0082*****	**0.0094*****	0.1356	0.4262	**0.0000*****
Italy	0.8798	0.4868	0.1217	**0.0703***	0.4484	0.3078
Latvia	0.1770	**0.0648***	**0.0453***	1.0000	0.9775	**0.0000******
Luxembourg	0.7839	**0.0410****	0.1616	0.2544	0.1524	**0.0000******
Malta	0.4769	**0.0265****	**0.0185****	0.8003	**0.0042*****	**0.0000******
Netherlands	**0.0053****	**0.0000*****	**0.0051*****	**0.0009*****	**0.0291****	**0.0045*****
Portugal	0.6186	0.4528	0.3739	**0.0005*****	0.1463	0.1302
Slovakia	0.1079	0.1136	**0.0144****	0.4434	0.2031	0.3442
Slovenia	1.0000	0.4990	0.4944	**0.0000*****	**0.0001*****	**0.0078*****
Spain	0.7731	0.1672	0.2141	0.4638	0.6761	0.3371

Note: * denotes significance at 10 percent level, ** denotes significance at 5 % level, *** denotes significance at 1 % level. ADF stands for Augmented Dickey Fuller test estimated with lags specified from the optimum lag criterion suggested by Ng-Perron seq t, minimal value of SC and MAIC from the general least square procedure. PP stands for Phillips-Perron unit root test. Grey highlighted cells signify variables that are likely to exhibit I(2) behavior. First diff stands for first difference of variables expressed in logs. Variables in levels are expressed in logs.

Table A3: Results from the ARDL bound test estimation with nominal GDP as dependent variable

	Austria	Belgium	Estonia	Finland	France	Germany
Lags	2	3	1	1	1	1
gdp_1	***-0.5092******	0.0048	-0.0424	***-0.4586****	***-0.3120******	***-0.1750******
	(0.0000)	(0.9624)	(0.7793)	***(0.0506)***	***(0.0043)***	***(0.0007)***
credit_1	***0.2226******	-0.0168	-0.0265	-0.0011	***0.0844****	***0.6001****
	(0.0002)	(0.6635)	(0.8895)	(0.9771)	***(0.0342)***	***(0.0285)***
gdp_diff_1	-0.0662	***0.4014****	0.3343	0.0245	***0.4151******	0.0852
	(0.5806)	***(0.0755)***	(0.1273)	(0.7871)	***(0.0020)***	(0.5113)
gdp_diff_2	***0.2487******	-0.3742				
	(0.0068)	(0.1158)				
gdp_diff_3		-0.2135				
		(0.3050)				
credit_diff_0	***0.4026****	0.0459	-0.1832	-0.0082	0.3014	***1.0278****
	(0.0747)	(0.5923)	(0.5339)	(0.9868)	(0.1368)	***(0.0957)***
credit_diff_1	-0.1259	-0.0803	***-0.3781****	***-0.8666******	***-0.3412****	***-2.3220****
	(0.3732)	(0.1341)	***(0.0440)***	***(0.0058)***	***(0.0294)***	***(0.0163)***
credit_diff_2	***-0.5698****	-0.0411				
	(0.0113)	(0.5042)				
credit_diff_3		-0.0773				
		(0.1331)				
autocorrelation	0.1616	0.1026	0.5131	0.5526	0.1308	0.6384
heteroscedasticity	0.1375	0.2044	0.3056	0.2478	0.3329	0.2488
normality	0.5532	0.6416	0.4315	***0.0320****	0.2700	0.1511
Long run multiplier	***0.4372***	3.5000	-0.6250	-0.0024	***0.2705***	***3.4291***

Note: * denotes significance at 10 percent level, ** denotes significance at 5 % level, *** denotes significance at 1 % level. Diff stands for first difference. Numbers attached to variables signify order of the lag. ARDL bound test performed, lags specified according to the BIC information criteria from VAR system and adjusted for no autocorrelation present and normality of residuals. Standard errors estimated with heteroscedasticity robust standard estimator. Values in brackets represent respective p-values. Autocorrelation test by Breusch-Godfrey test for autocorrelation up to order 4, normality of residuals tested by Jarque-Berra test, heteroscedasticity of residuals tested by White's test for heteroscedasticity.

Table A4: Results from the ARDL bound test estimation with nominal GDP as dependent variable (cont'd)

	Greece	Ireland	Latvia	Luxembourg	Malta	Netherlands
Lags	1	2	1	1	1	1
gdp_1	***-0.1099******	***-0.3309****	-0.6052	0.2276	***-0.1827****	***-0.3113******
	-0.0068	***(0.0100)***	(0.2788)	(0.1072)	***(0.0783)***	***(0.0030)***
credit_1	***-0.0764****	***-0.0562******	-0.2405	***0.2750****	***0.1452****	0.0117
	(0.0289)	***(0.0013)***	(0.3254)	***(0.0223)***	***(0.0488)***	(0.7108)
gdp_diff_1	-0.0709	0.0279	0.0449	***-0.3401****	-0.1905	***0.4953****
	(0.7869)	(0.7801)	(0.9175)	***(0.0335)***	(0.3222)	***(0.0267)***
gdp_diff_2		-0.0082				
		(0.9640)				
gdp_diff_3						
credit_diff_0	***-0.0985****	***-0.1632****	***-0.4224****	0.1117	0.0065	-0.0293
	(0.0788)	***(0.0425)***	***(0.0111)***	(0.6584)	(0.9746)	(0.6151)
credit_diff_1	0.0837	***-0.2730******	0.2285	0.0484	***-0.2321****	-0.0061
	(0.1302)	***(0.0029)***	(0.3232)	(0.6719)	***(0.0660)***	(0.9226)
credit_diff_2		***0.4237******				
		(0.0000)				
credit_diff_3						
autocorrelation	0.1693	0.7338	0.8068	0.8140	0.2494	0.7105
heteroscedasticity	0.2544	0.1665	0.6417	0.3572	0.1291	0.7223
normality	***0.0178****	0.5496	0.7598	0.2625	0.2325	0.9614
Long run multiplier	***-0.6952***	***-0.1698***	-0.3974	**-1.2083**	**0.7947**	0.0376

Note: * denotes significance at 10 percent level, ** denotes significance at 5 % level, *** denotes significance at 1 % level. Diff stands for first difference. Numbers attached to variables signify order of the lag. ARDL bound test performed, lags specified according to the BIC information criteria from VAR system and adjusted for no autocorrelation present and normality of residuals. Standard errors estimated with heteroscedasticity robust standard estimator. Values in brackets represent respective p-values. Autocorrelation test by Breusch-Godfrey test for autocorrelation up to order 4, normality of residuals tested by Jarque-Berra test, heteroscedasticity of residuals tested by White's test for heteroscedasticity.