Does monetary policy affect lending? Evidence from some panel data

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ABSTRACT

This paper examines the impact of monetary policy on bank lending. There is also a contribution to the empirical evidence of the fact that lending expansion was one of the causes of the Great Recession. We develop a dynamic model following the GMM method in two steps using a no-balanced panel of 36 countries of the OECD and the European Union of the period between 1961 and 2012. The study focuses on some aggregated bank sector characteristics in different countries. We show the existence of a bank sector lending channel. We also conclude that the years 2003-2004 provoked a significant loan increase that led to the financial crisis started in 2007.

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1. Introduction

Monetary policy influences many economic variables, as the interest rate or the exchange rate. Since the revelation of the influence of monetary policy on the real economy carried out by Friedman and Schwartz (1963), many studies have attempted to distinguish the different channels of monetary transmission. This paper focuses on the effects of monetary policy in credit. It is the so called credit channel (Bernanke and Blinder, 1988). This channel is divided in two sub-channels: the balance sheet channel (Bernanke and Gertler, 1995; De Bondt, 2004) and the bank lending channel. Impact of monetary policy in the bank lending channel is studied in this paper. According to this channel, shifts in monetary policy cause a change in the bank credit. Monetary policy affects bank deposits and their access to loans supply (Bernanke and Blinder, 1988). An expansive monetary policy provokes increasing bank deposits, which expands lending supply.

Many studies have analyzed the effects of monetary policy into lending depending of bank-specific characteristics. The main bank-specific characteristics used on the literature are: size, liquidity, capitalization, credit risk, securitization and bank market power. Smaller banks are more influenced by a tight monetary policy (Kashyap and Stein, 2000; Kishan and Opiela, 2006; Altunbas et al., 2009). Worse capitalized banks respond more to monetary policy (Kishan and Opiela, 2006; Altunbas et al., 2009; Gambacorta and Mistrulli, 2004; Gambacorta, 2005). Less liquid banks have more impact of monetary changes (Kashyap and Stein,

2000; Ehrmann et al. 2003; Gambacorta and Mistrulli, 2004; Gambacorta, 2005; Altunbas et al., 2009; Matousek and Sarantis, 2009). Higher credit risk banks are more affected by monetary contractions (Altunbas et al., 2010; Bogoev, 2010; Adelino and Ferreira, 2014; Cantero-Saiz et al.; 2014). Less securitization improves monetary policy (Loutskina and Strahan, 2009; Altunbas et al., 2009; and Gambacorta and Marques-Ibanez, 2011). Higher level of bank competition (less market power) forces to a higher influence of monetary policy (Adams and Amel, 2005, 2011; Gunji et al., 2009; Olivero et al., 2011; Turk-Ariss, 2010; Brissimis, Delis and Iosifidi, 2012; Fungáčová and Weill, 2013; Fungáčová, et al., 2014; Leroy, 2014). Furthermore, Iacoviello and Minetti (2008) demonstrated the existence of a bank-lending channel in the housing market.

There is no doubt the origin of the Great Recession that started in 2007 was the monetary excess of the previous years, as Taylor (2009) mentioned. The Great Moderation started at the end of the petrol crisis, when Central Banks followed the Taylor rule. The terrorist attacks of 2001-09-11 and the crisis of high-technology enterprises of early 2000s supposed a monetary policy change in almost all the world, when Central Banks did not follow Taylor rule until 2006. The cause was the prevision of a bank panic that never occurred. This lax monetary policy provoked a housing boom and a terrible bust.

As Fungacova, Solanko and Weill (2014) said, since summer of 2007 the ECB has been reacting to the crisis by expanding on the set of conventional and unconventional policy tools. These unconventional policies do not use the

interest rate as an instrument. In contrast, they use total central bank assets to expand monetary policy. In this way, as Keynes (1923) said at the "Tract of Monetary Reform", the target of the Central Banks is the control of the amount of money, even more nowadays when the interest rate is so low that its control is obstructed. Now, some papers have studied the influence of the crisis on the bank lending channel (Beltratti and Stulz, 2009; Altunbas et al., 2009; Gambacorta and Marques-Ibanez, 2011; Brei et al., 2013).

In this paper we introduce a study of the bank lending channel aggregating all the banks of the economy in a bank sector. Thus, we show smaller bank sector economies and worse capitalized bank sector economies have a higher impact of monetary contraction. Furthermore, we follow Keynes (1923) and we analyze monetary policy with the money supply growth indicator. With this approach, central banks aims to control the money supply as an instrument, not the interest rate. The next contribution is the relevance of the previous years of the crisis (2003-2004) as years when the loan increased significantly. In these years most of the central banks applied a monetary policy which did not follow Taylor rule. This fact unchained the Great Recession.

The layout of the paper is as follows. Section 2 explains the data and develops the econometric model, using a dynamic panel data model estimated by the GMM method in two steps. We use a no-balanced panel from 1961 to 2012 for 36 countries, all the EU (27) and OECD countries with the exceptions of Switzerland, Cyprus, Romania and Malta. In section 3 we present the results. The

main results are the existence of a bank lending channel, the effectiveness of the monetary policy on lending and the fact that the previous years of the crisis formed a significant period of lending increase. Section 4 discusses the main results, showing empirical evidence of one of the causes of the crisis, the lax monetary expansion of 2003-2004 that leads an increase of lending. Finally, in section 5 conclusions are provided.

2. Econometric model and data

The formula (1) is a dynamic equation estimated by the GMM method in two steps developed by Arellano and Bover (1995) and Blundell and Bond (1998). It allows to avoid the endogeneity problems lagging variables.

The empirical specification is based on Ehrmann et al. (2003). The following equation reflects interactions between monetary policy, measured as the money supply growth, and a bank sector characteristic:

$$
\begin{aligned}
\ln(L_{i,t}) = a_i + \sum_{j=1}^{l} b_j \ln(L_{i,t-j}) + \sum_{j=0}^{l} c_j \ln M_t + \sum_{j=0}^{l} d_j X_{i,t-1} + \\
\sum_{j=0}^{l} e_j \ln M_t X_{i,t-1} + \sum_{j=0}^{l} f_j Y_{i,t} + \sum_{j=0}^{l} g_j Z_{i,t} + \varepsilon_{i,t}
\end{aligned}
\tag{1}
$$

with i = 1, . . . ,N and t = 1, . . . ,T and where T is the number of temporal periods, N the number of countries, $L_{i,t}$ the loans, *lnloans*; $\ln M_t$ the monetary policy indicator, represented by the growth rate of the monetary supply, *lnM*;

$X_{i,t-1}$ denotes the bank sector characteristics of the country, lagged in order to avoid endogeneity and the economy-specific characteristics of the country (Gross Domestic Product growth, *lngdp*; value of the stock exchange, *stock*; inflation, *inflation*; and investment, *investment*) are denoted by $Y_{i,t}$. Finally, $Z_{i,t}$ are the temporal dummy variables.

The presence of a bank lending channel should be reflected in a significant coefficient for the interaction of bank sector specific characteristics (size, *size*; liquidity, *liquidity*; capitalization, *capital*; and bank market power, *lerner*) with the changes of the money supply controlled by the monetary authority. The regression also includes temporal dummies to control possible effects of the economic crisis, and four economy-specific characteristics of the country (GDP (Gross Domestic Product) growth, value of the stock exchange, inflation and investment) that allow us to capture cyclical movements and are useful in order to control demand effects and to isolate the monetary policy.

Data are available in World Bank data. Size of the financial sector is measured by the ratio of loan supply to GDP, liquidity is the share of liquid bank reserves in total bank assets, capitalization is the ratio of bank capital and reserves to total bank assets, and the market power is measured by the Lerner index. It compares output pricing and marginal costs (that is, markup) in the banking market, as defined by World Bank. An increase in the Lerner index indicates a deterioration of the competitive conduct of financial intermediaries.

Investment is the gross capital growth, obtained by the sum of all the increases of fix assets and the net variation of stocks. Inflation is measured as the annual variation of the cost of a shopping basket for a customer. The value of the stock exchange is the product of the price of the shares and their quantity. The loans are the total internal credit provided by the financial sector, the financial resources provided to the private sector by financial corporations, and it includes the gross credit to the private sectors and the net credit to the central government.

Panel data are used. Concretely, it is used a no-balanced panel of the year 1961 to 2012 from 36 countries, all the EU (27) and OECD countries with the exceptions of Switzerland, Cyprus, Romania and Malta. Table 1 gives some basic information about data and variables.

Table 1. Summary statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
lngdp	1647	25.24315	1.950987	19.35239	30.41878
lnM	1269	19.3518	42.15664	-28.62978	829.307
stock	832	54.8372	46.55807	0.0198936	479.8116
liquidity	395	7.810793	9.323307	0.2296138	60.94282
capital	415	7.007952	2.442035	2.7	17.4
lerner	535	0.1851031	0.1177539	-1.60869	0.503105
investment	1527	23.59319	5.197639	2.388235	53.31139
inflation	1518	11.16206	39.33546	-4.479938	1058.374
Year 2002	1872	0.0192308	0.1373719	0	1
Year 2003	1872	0.0192308	0.1373719	0	1

Correlations among independent variables used in the model are shown in the Table 2. The variables with high correlation have not been included in the models and hence, in the matrix.

Table 2. Correlation matrix of independent variables.

	lngdp	*lnM*	*stock*	*liquidity*	*capital*	*lerner*	*investment*	*inflation*
lngdp	1							
lnM	-0.2915	1						
stock	0.2788	-0.0149	1					
liquidity	-0.3312	0.1064	-0.3866	1				
capital	-0.3145	0.3118	-0.3118	0.3541	1			
lerner	0.0185	0.0673	-0.0786	0.0089	0.0399	1		
investment	-0.3173	0.4288	-0.0604	0.2496	0.1576	0.1365	1	
inflation	-0.2344	0.2602	-0.2246	0.2852	0.3516	0.1201	0.204	1

The greatest correlation is the correlation between *lnM* and *investment*, with a value of 0.4288. This correlation is far from 0.9, so it can be said that there is a lack of multicolineality.

3. The results

The results of the paper are summarized in Table 3, which represents the effects of the different variables on the bank lending in the short-term, measured as elasticities. The models were estimated following the GMM method in two steps developed by Arellano and Bover (1995) and Blundell and Bond (1998). The model they suggested ensures efficiency and consistency, and it is robust to heterocedasticity. Absence of serial correlation of order two and the validation of the instruments used are tested with the Arellano and Bond (A-B) and the Sargan test respectively.

Table 3. Estimated models.

	(I) Complete dynamic model		**(II) Definitive dynamic model**	
	Coefficient	SE	Coefficient	SE
lnloant-1	0.7843568***	0.1208543	0.6433371***	0.0662652
lngdp	0.264275*	0.1391642	0.422798***	0.0776223
lnM	0.0114756	0.0074616	0.0059458***	0.0017457
stock	0.0008203*	0.0004192		
liquidity	-0.001708	0.004776		
capital	0.019104	0.0166714		
lerner	0.1884458**	0.0950023	-0.0005684***	0.0001969
*lnM*liquidity*	0.000121	0.000293		
*lnM*capital*	-0.0007726	0.0006539		
*lnM*lerner*	-0.0205004**	0.0094437		
investment	0.0180286***	0.0038216	0.0183664***	0.0029271
inflation	0.001511	0.0038702		
Year 2002	-0.0006413	0.0485412		
Year 2003	0.1034558*	0.0620477	0.0465357***	0.0168343
Year 2004	0.0472981	0.044387	0.0243087*	0.0128966
Year 2005	0.0400017	0.028887		
constant	-1.810476**	0.7266073	-2.096259***	0.5427317
No observations	307		392	
No instruments	39		30	
Sargan test (2nd step; p-value)			0.1109	
MA (1), MA (2) (p-value)			0.0049	0.9484

* Significance level of 10%,** significance level of 5%, *** significance level 1%.

The model (II) is the definitive dynamic robust model estimated. The Sargan and A-B tests have been calculated with the indicated model, but without robustness, in order to be able to test them. As shown tested the model (II) is not subject to serial correlation of order two (using the A-B test) and the instruments are valid (using the Sargan test). The differences among the two dynamic model estimations are: the model (I) is the complete model, with all the independent variables without multicolineality, and the dummies of the years and some

interactions between variables. There is a lag of the dependent variable. The model (II) is obtained after a process of elimination of the no significant independent variables. The same model estimated in static (by fix effects, without the lag of the dependent variable) obtains an R squared of 0.9202, hence our model is a high explanatory model.

Table 4 shows the effects of the significant variables of the definitive model (II) on the bank lending in the short term and in the long-run, measured as elasticities.

Table 4: Short-run and long-run elasticities of the variables of the model (II)

Variable	Short-run elasticities	Long-run elasticities
lngdp	0.422798	1.185427472
lnM	0.0059458	0.016670643
*lnM*capital*	-0.0005684	-0.001593662
investment	0.0183664	0.051495123
Year 2003	0.0465357	0.130475303
Year 2004	0.0243087	0.068155953
constant	-2.096259	-5.877423752

Long-run elasticities are calculated as formula 2 points:

$$l = \frac{s}{1 - \sum_{j=1}^{l} b_j} \tag{2}$$

Where l is the long-run elasticity, s the short-term elasticity, and the other variables are the same as in formula (1).

4. Discussion of the results

The definitive dynamic model, model (II) is used to interpret the results. Differences on short-term and long-run elasticities in monetary shocks and in the years before the financial crisis are shown at Figure 1.

Figure 1: Short-term and long-run elasticities
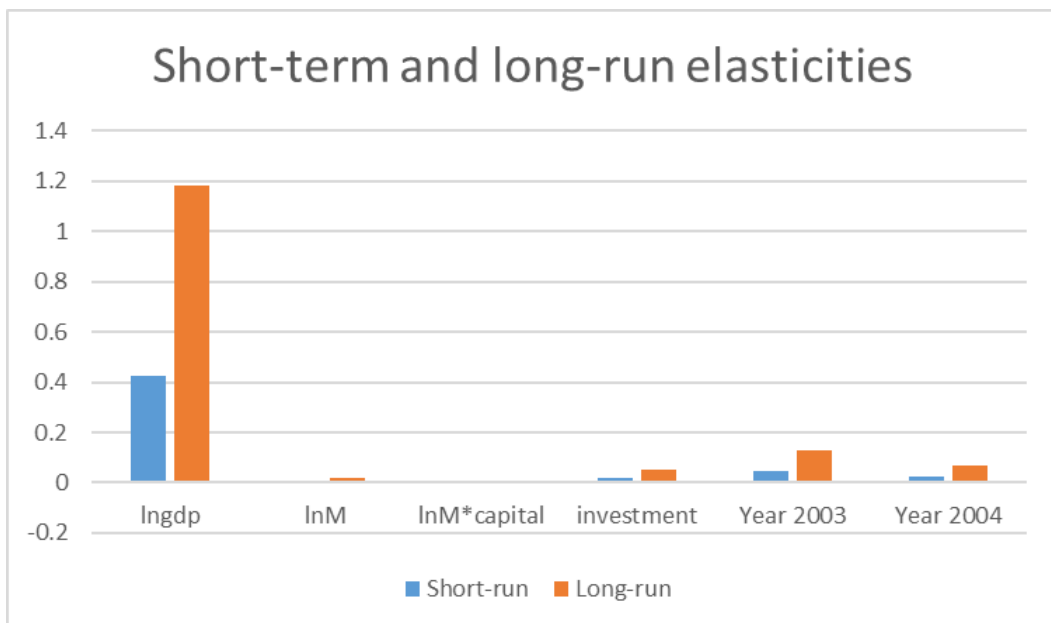
Source: own elaboration

Figure 1 shows the mechanism of expansion of the financial crisis. A positive influence of a monetary shock in lending can be observed. As mentioned in the introduction, after the 2001-09-11 and the crisis of the early 2000s, there was an

expansion of monetary policy in prevision to a bank panic that never occurred. This monetary expansion did not follow Taylor rule, which is useful to avoid business cycles and crisis. This positive monetary shock of years 2003-2004 encouraged the bank lending, as we can see on the Figure 1. The lending raise provoked a sharp increment of the economic growth over the natural growth, more than the expected by the literature. Since that, a vicious circle was generated: as we can see, economic growth encouraged lending too. It is commented that the rise of lending (and then, the expansion of real estate and complex funds) was the most important cause of the world financial crisis. And we show in this paper that the monetary shocks of 2003-2004 were a first step in the perverse chain.

4.1. Impact of the monetary policy on lending

A 1 percent increase in the money growth leads to a loan increment of around 0.0059 percent in the short-term and a lending increment of around 0.0167 percent in the long-run. It proves the no-neutrality of monetary policy to lending in the long-run and in the short-term, too. This effect is significant, so we can state monetary policy affects lending, answering the title question of the paper. We also prove the existence of a bank lending channel, being significant the interaction of monetary policy with capitalization, as we can see in the model (II). And the signs of the effects are those expected. The effects of a monetary tightening are smaller for banks with higher capital ratios. The theory predict that worse capitalized banks are more influenced by a tight monetary policy. This

confirms the existence of a bank-sector lending channel in Europe and the OECD. We show it can be transformed into aggregated economies terms: worse capitalized bank sector economies have a higher impact of monetary contraction. This means there is at least one bank sector lending channel in the countries studied. So we confirm the bank sector lending channel hypothesis in several countries of the world.

4.2.   *Evidence of causes of the financial crisis*

We can see a significant impact of the years previous to the crisis on the bank lending. Years 2003-2004 are significant dummies, being 2003 the year with the highest coefficient. Year 2003 means an increment of around 0.0465 percent of the bank lending in the short-term and a 0.0135 percent of loan increment in the long-run. All these facts reflect the monetary expansion of the years before the crisis. It forced a development of lending that led to the financial crisis. In this paper we suggest empirical evidence that confirms the theory: the expansion of lending that caused the current financial crisis was due to a monetary expansion in 2002-2005, which did not follow the Taylor rule, in particular the years 2003 and 2004. All years previous to the period between the petrol crisis (early 1980s) and 2002-2005, the years of the Great Moderation, central banks had followed Taylor rule, keeping the economy stable.

5. Conclusions

This paper analyzes how monetary policy measured as money supply growth influences bank credit supply. This paper also contrasts whether lax monetary expansions of the years before the Great Recession influenced to the raise of lending, which caused the crisis as theory predicts.

After the 2001-09-11 and the crisis of the early 2000s, there was an expansion of monetary policy in prevision to a bank panic that never occurred. This monetary expansion did not follow Taylor rule, which is useful to avoid business cycles and crises. This positive monetary shock of years 2002-2005 encouraged bank lending. The lending raise provoked a sharp increase of the economic growth over the natural growth, more than the theoretically expected. Since then, a vicious circle was generated: economic growth encouraged lending too. It is said that the rise of lending (and the expansion of housing funds and its corresponding process of financial innovation) was the most important cause of the world financial crisis. We demonstrate in this paper that the monetary shocks of 2003-2004 contributed significantly as a first step in the perverse chain.

Using a large sample of countries, we find the significance of the period 2003-2004 in order to affect bank lending and also of the monetary expansion of that period as one of the causes of the Great Recession. We also find the existence of a bank sector lending channel via capitalization. We contribute testing the presence of this channel with the use of money supply growth as an indicator of monetary policy. We also expand the bank-specific characteristics of many banks

of a country to bank sector characteristics of different countries. Finally, we prove the no-neutrality of monetary policy on credit supply.

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