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The bank lending channel in Peru: evidence and transmission mechanism

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The Bank Lending Channel in Peru

Evidence and Transmission Mechanism

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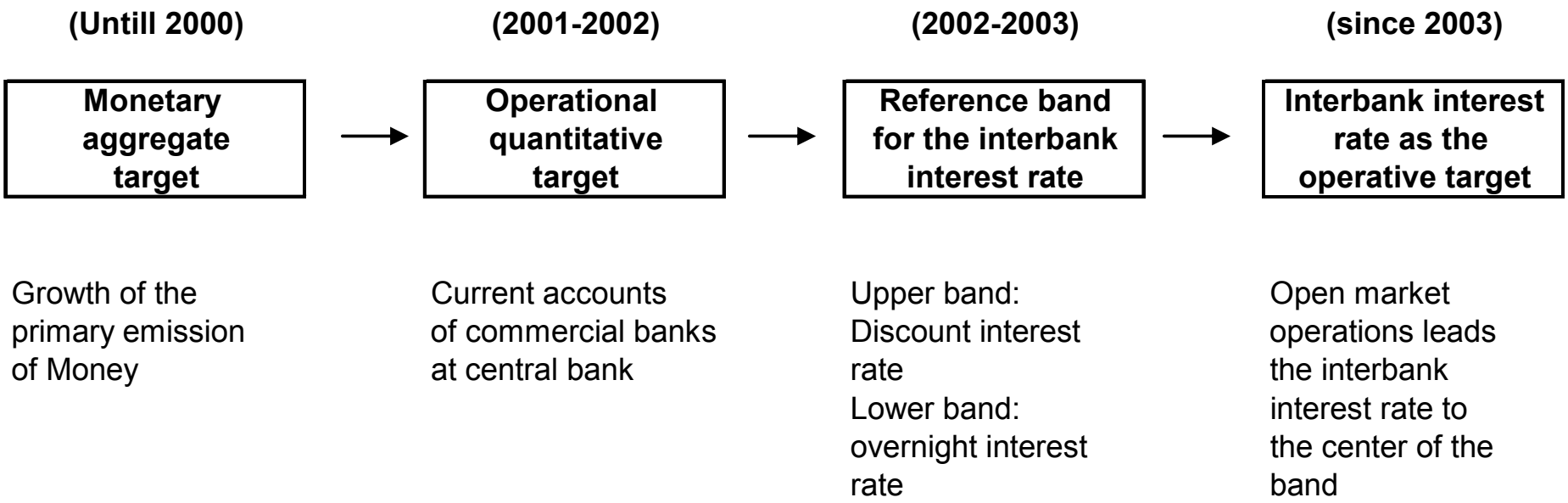
Motivation

- In the past ten years, the Peruvian economy has experienced different monetary policy changes.
- One of those policy changes is the switch from an aggregate monetary target to an interest rate as the operating target.

Operating target:



Source: Rossini and Vega (2006).

Relevant policy questions:

- Is there any evidence of an operating bank lending channel?
- If so, is it important as a mechanism of transmission of the monetary policy?

What is bank lending channel?

The bank lending channel is based on the role of the banks as either amplifying or slowing down the effects of the monetary policy shocks over macroeconomic activity through the lending process (supply of credit loans).

Literature review: Theory

- Bernanke and Blinder (1988) is the first theoretical formulation of the bank lending channel within an IS/LM-type setting.
- Stein (1998) builds a model which considers the existence of a bank lending channel based on adverse selection.
- Walsh (2003) analyzes the conditions under which the loan supply might be perfectly elastic.

Literature review: Theory (2)

- Ehrmann, Gambacorta, Martínez-Pages, Sevestre, and Worms (2003) model the loans market and find an equation for bank loans. This equation relates the response of banks' loans to monetary policy shocks:
  - Directly (the money channel)
  - Bank characteristics (the lending channel).

Literature review: Empirics

- Identification strategies:
  - Use of bank-level data to account for heterogeneity in the response of banks to changes in monetary policy (bank-level characteristics: capitalization, size and liquidity). Kashyap and Stein (1995, 2000), and Kishan and Opiela (2000).
  - Estimation of VEC models. The supply and demand for loans can be identified by testing for multiple cointegrating relationships (modeled jointly, rather than in a one-equation reduced-form setting). Kakes (2000), Calza et al. (2006) and Mello and Pisu (2010).

Literature review: Empirics (2)

- Identification strategies (2):
  - Panel data that allows the reaction of bank loans to monetary policy to become dependent on the bank characteristics. Ehrmann et al. (2003), Hernando and Martinez-Pages (2001), Alfaro et al. (2004), Gambacorta (2005), and, Mautosek and Sarantis (2009).

The Model

- Model of Ehrmann et al. (2003).
- A bank that is profit-maximizing.
- Departs from a balance sheet identity.
- Presents a demand for bank loans that is related to macroeconomic variables.
- Bank capital is a proportion *k* of Loans
- A fraction *s* of deposits is secured.

Source of funding

- Aggregate deposit demand: $D = -\theta r_s$

where r_s is the monetary policy rate.

- After a monetary tightening, aggregate deposits fall, reducing the source of funding.
- Alternative source of funds:
  - It is unsecured.
  - Banks have to pay an additional interest rate.

Bank as a Risky agent

- If risky, bank has to pay an external financial premium.
- The interest rate that a bank has to pay:

$$r_{B,i} = r_s(\mu - \gamma x_i)$$

where x_i is a signal of the health of the bank.

FOC

- The profit of bank *i* is given by:

$$\pi_i = L_i r_{L,i} + S_i r_S - B_i r_{B,i} - \Psi_i$$

- Replacing and assuming equilibrium in the loan market, the FOC of a bank that maximizes w.r.t. L_i can be written as:

$$L_i = \frac{\alpha_i}{2} y + \frac{\alpha_2}{2} p - \frac{\alpha_0 \mu (1-k)}{2} r_S + \frac{\alpha_0 \gamma (1-k)}{2} x_i r_S - \frac{\alpha_0}{2} \frac{\partial \Psi_i}{\partial L_i}$$

Money view and BLC

- In the money view, $r_{B,I}$ is equal to r_S because there is no information asymmetries and no external finance premium: the response of all banks are the same to monetary policy.
- In the BLC, the costs for raising non-secured funds depends on the degree of information rigidity in the financial markets. Different banks face different costs for raising non-secured funds. Then some banks reduce their lending by more.

Identification of the BLC

- In this framework, the significance of the coefficient of $x_i r_s$ allows the identification of changes in the supply of loans in the presence of a tightening of the monetary policy.

Identification of the BLC: Empirics

$$y_{it} = \sum_{j=0}^{K} y_{it-1} + \sum_{j=0}^{K} x'_{it-j}\,\beta + z'_{it-1}\,\gamma + \sum_{j=0}^{K} x_{3it-j}\, z'_{it-1}\,\varphi + u_{it} \qquad (11)$$

where:

y_{it} = annual growth of total loans, commercial loans, and consumer loans.

x_{it} = vector of macroeconomics variables, x_{3it} is the interbank interest rate.

z_{it} = vector of bank specific characteristics variables (liquidity, size, and capitalization)

u_{it} = error term vector.

Bank level panel

Effects of Monetary Policy over Loans Supply

Dependent variable	Coefficient	Standard error
1 Growth of total loans		
Real GDP growth	3.23 *	2.02
Real exchange rate devaluation	-4.36 ***	1.53
Interbank interest rate	-10.35 **	5.15
Bank characteristic and Interbank interest rate		
Liquidity	-12.92	25.90
Size	13.24 **	7.15
Capitalization	17.44	56.06
2 Growth of commercial loans		
Real GDP growth	18.43 ***	4.83
Real exchange rate devaluation	-3.34	2.59
Interbank interest rate	-14.96 *	8.17
Bank characteristic and Interbank interest rate		
Liquidity	-49.48	47.27
Size	26.37 **	12.98
Capitalization	-171.16	125.65
3 Growth of consumer loans		
Real GDP growth	0.54	1.48
Real exchange rate devaluation	-0.15	0.82
Interbank interest rate	-19.05 ***	3.33
Bank characteristic and Interbank interest rate		
Liquidity	50.34 *	45.96
Size	37.20 ***	12.41
Capitalization	-814.19	681.57

One, two, and three stars indicate, respectively, statistical significance at the 10, 5, and 1 percent level.

- In these estimates, I find evidence that, on average, monetary policy has the capacity to affect the total supply of bank credit loans.
- An increase in the interbank interest rate reduces the supply of bank credit loans and increases the supply of bank credit loans.
- Liquidity became more important for consumer loans.

Overall Effect of a Monetary Policy Shock on the Growth Rate of Loans (by percentile)

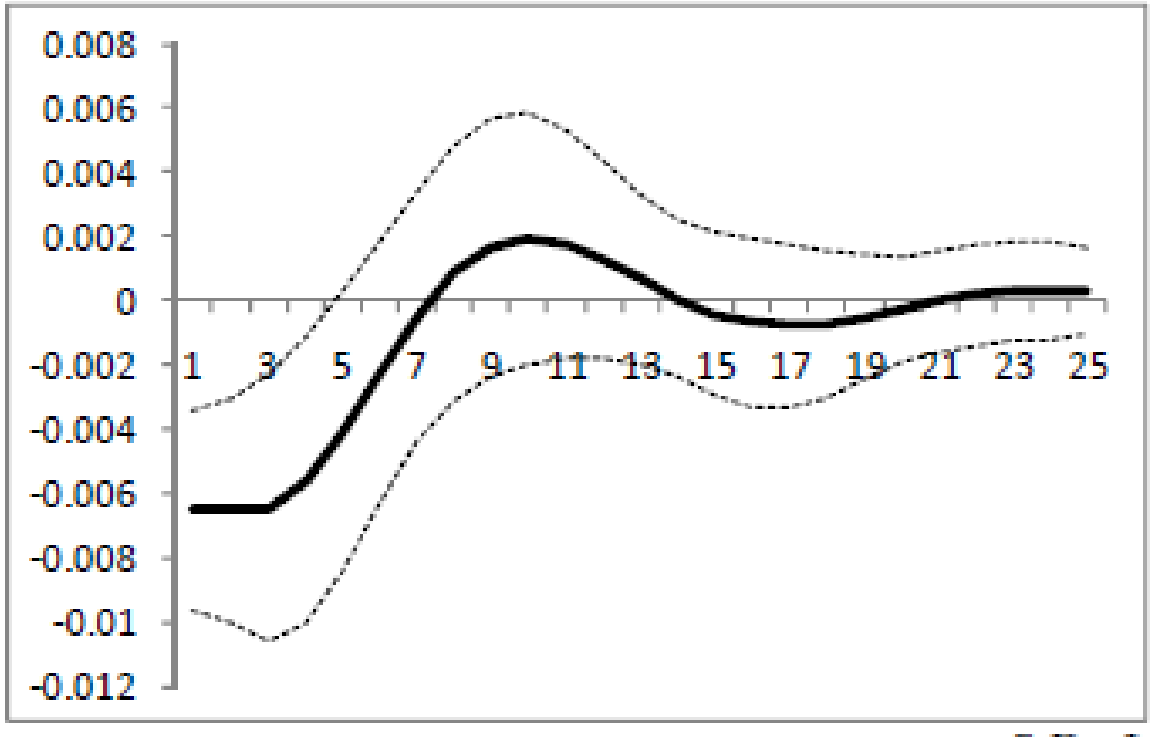
Type of loan	Liquidity			Size			Capitalization		
	25	50	75	25	50	75	25	50	75
Total	-10.4	-10.4	-10.4	-10.2	-10.0	-9.1	-10.4	-10.4	-10.4
Consumer	-9.5	-6.3	-0.8	-18.7	-18.1	-15.5	-19.0	-19.0	-19.0
Commercial	-15.0	-15.0	-15.0	-14.7	-14.3	-12.5	-15.0	-15.0	-15.0

Flight-to-quality

- More evidence in favor of the bank lending channel is the rejection of the null hypothesis that the credit variable is not helping to predict macroeconomic activity.
- This hypothesis can be tested and be complemented with two simultaneous conditions: rejection of the null hypothesis that the interbank interest rate is irrelevant to predict the credit variable, and rejection of the null hypothesis that the variable proxy of economic activity is useful to predict the credit variable.

- I estimate six VAR models and each one has a different measure of macroeconomic activity: GDP, output gap, industrial production, private investment, private consumption, and unemployment rate.
- A negative monetary policy shock would decrease the credit quality ratio (flight-to-quality effect, strong effect over households and small businesses that have banks as the only source of external financing).

MONETARY POLICY AND THE CREDIT QUALITY RATIO



- Using Granger causality tests, the CQR helps to predict macroeconomic activity in four out of six estimations. For the interbank interest rate, it is not significant for predicting macro activity in four out of six when the BLC is considered.
- Macro activity would not help to predict CQR in all cases, whereas the interbank interest rate would help to predict CQR in one out of six cases (four out of six cases, if the ten percent of statistical significance is considered.)
- These results suggest that causality goes from monetary policy stance to the banking credit loans, and from credit loans to macroeconomic activity. This additional piece of information confirms the presence of BLC.

Credit Quality and Macroeconomic Activity
VAR Pairwise Grager Causality/Block Exogeneity (Wald tests)
P values from exclusion test

Models classified according to proxies for macroeconomic activity	Variable excluded from: 1/			
	Macroeconomic activity equation	P value (percent)	Credit quality ratio equation 2/	P value (percent)
GDP	Interbank interest rate	41.8	GDP	46.3
	Credit quality ratio	0.3	Interbank interest rate	5.0
Output gap	Interbank interest rate	64.7	Output gap	28.2
	Credit quality ratio	95.1	Interbank interest rate	7.1
Industrial production	Interbank interest rate	0.6	Industrial production	93.0
	Credit quality ratio	3.7	Interbank interest rate	8.4
Private investment	Interbank interest rate	92.1	Private investment	26.0
	Credit quality ratio	2.5	Interbank interest rate	27.8
Private consumption	Interbank interest rate	75.0	Private consumption	95.7
	Credit quality ratio	21.1	Interbank interest rate	8.1
Unemployment rate	Interbank interest rate	1.3	Unemployment rate	82.5
	Credit quality ratio	0.9	Interbank interest rate	28.1

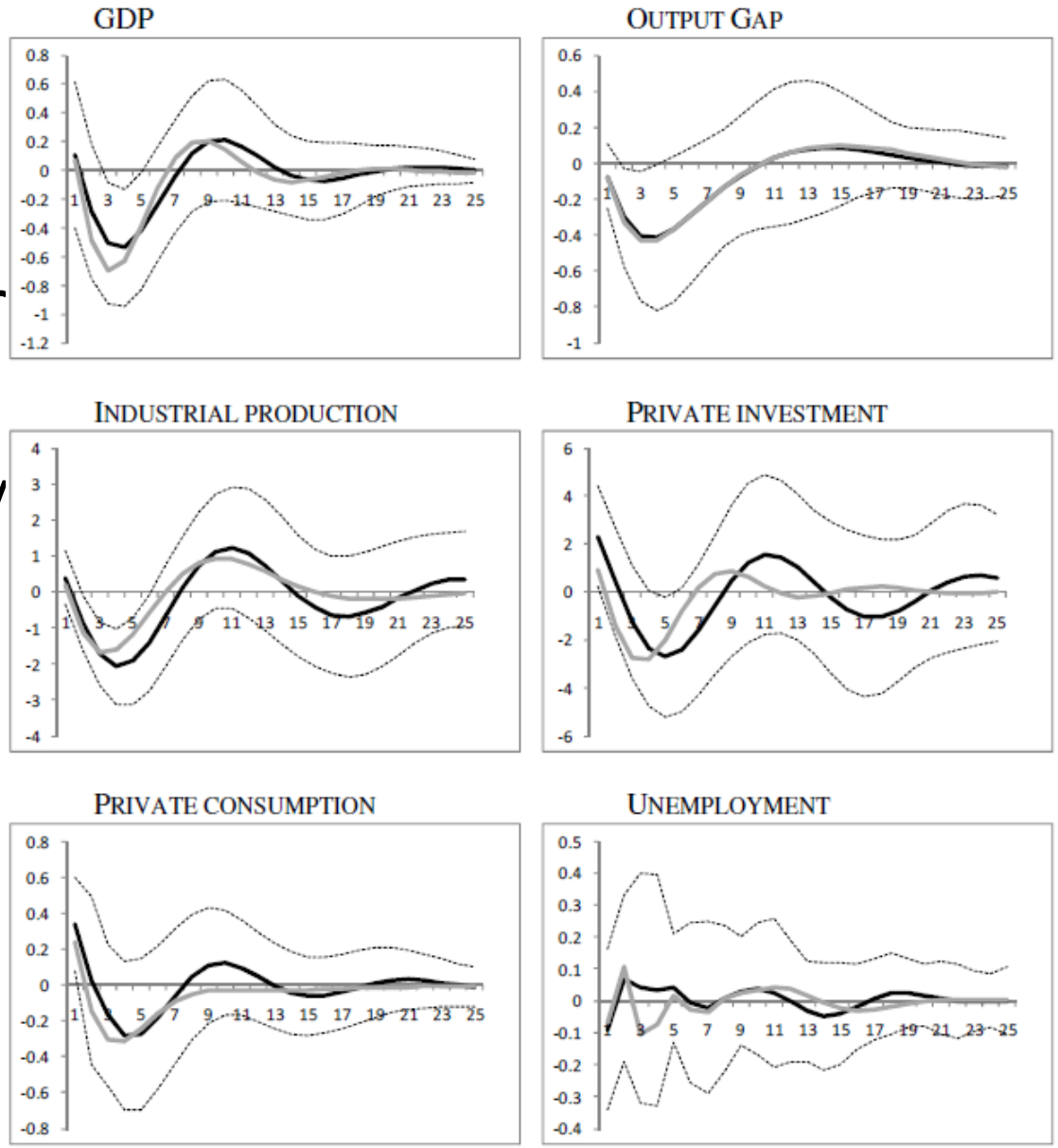
Relevance of the channel

- To identify the relevance of this channel I compare one scenario in which this channel is totally annulled versus a scenario where this channel holds. The difference between impulse-responses to a monetary policy shock would give a measure of the relevance of the bank lending channel for describing macroeconomic activity.
- To determine if the difference is statistically significant, I estimate the intervals of confidence at 95 percent for each impulse-response when the bank lending channel is endogenous.

SVARs

- The set of variables are divided in three recursive groups: non policy variables that are contemporaneously affected by the monetary policy variable, monetary policy variable, and non policy variables that are not contemporaneously affected by the monetary policy variable. This specification allows a complete identification of the VAR system.
- The central bank policy reaction function is identified by dividing the variables into non monetary policy variables that cause a policy reaction and non monetary policy that are affected by the policy decisions.

- In five out of six estimations, the results are statistically significant.
- The use of the CQR for identifying the evolution of macroeconomic activity is not important and the bank lending channel identified in the previous sections is not necessary for identifying the transmission mechanism of the monetary policy.



Conclusions

- I identified a bank lending channel during the period 2002-2007 using bank level data.
- A series of VAR exercises and Granger causality tests identify the directionality of the causality goes from the interbank interest rate to the credit variable, and from the credit variable to macroeconomic activity variables.
- Using SVARs, I find that this channel would not have been important and/or it would have been annulled by other effects that may not be fully considered in this work (like market imperfections, firms' balance sheet, strength of the banking system, among others).

Agenda

- Use of co-integrations techniques (subject to a bigger sample data, to include long-term effects).
- I am currently expanding the sample period and compare two scenarios: when money emission and when the interest rate are considered as intermediate target.
- Too big to fail.