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Expansionary Balance Sheet Policies and Banking Competition: Implications for Credit Markets

Juan Carlos Medina Guirado *

Abstract

We analyze unconventional monetary policy tools, most notably large-scale asset purchases in the form of long-term public debt, that have greatly expanded central bank's balance sheets for more than a decade now. Additionally, considering that banking systems in major economies have experienced rising market concentration, this paper examines how competition in the banking sector influences the effectiveness of expansionary balance sheet policies in stimulating credit market activity. The analysis shows that under perfect competition, higher money growth lowers interest rates and increases lending, particularly when the crowding-out effects of government debt are limited. Likewise, central bank bond purchases consistently support credit expansion. In contrast, under monopoly banking, higher money growth tends to reduce funding costs and encourage lending except when the opportunity cost of holding money is low and liquidity shocks are substantial.

Keywords: *monetary policy, credit markets, banking sector competition.*

Politicas de expansion de la hoja de balance y competencia bancaria: implicaciones para los mercados crediticios

Resumen

Analizamos los instrumentos de política monetaria no-convencional, en particular la compra de deuda pública a largo plazo que ha expandido considerablemente las hojas de balance de los bancos centrales por ya más de una década. Al mismo tiempo, la concentración del mercado bancario en las grandes economías se ha incrementado. En este artículo, analizo cómo la competencia en el sector bancario distorsiona la habilidad de las políticas de expansión de hoja de balance para afectar al mercado de crédito. Los resultados sugieren que bajo bancos perfectamente competitivos, mayores tasas de crecimiento de la masa monetaria reducen las tasas de interés e incrementan la oferta de préstamos. Esto también aplica en economías con altamente endeudadas si el efecto sustitución es bajo. Así, las compras de bonos por el banco central promueven el crédito. De manera distinta, bajo un banco monopólico, altas tasas de crecimiento de la oferta monetaria reducen los costos de fondeo y promueven la oferta de crédito excepto cuando el costo de oportunidad del efectivo es bajo y los shocks de liquidez son de magnitud considerable.

Palabras clave: *política monetaria, mercados crediticios, competencia bancaria.*

JEL: *E52, G21, L13.*

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➲ 1. Introduction.

The 2007 financial crisis brought the industrial organization of the global banking sector to center stage. In the case of Mexico, according to Castellanos et. al. (2016), the Mexican banking sector reached its peak competition level in 2008 but achieving one of its lowest levels in 2009. Recently, (as of March 2025), the top 5 banks in Mexico held 60 percent of national banking assets[1]. In the case of the U.S., the increasing market concentration among a few banking institutions has been a trend boosted by financial turmoil. For example, Adams (2012) highlights that in the U.S. in 1980, around 19,069 banks existed whereas in 2010 this number declined by more than half to 7,011 institutions. Similarly, the 10 biggest banks managed around 13.5% assets in the financial system, whereas in 2010, this proportion increased to almost 50%. The situation has not improved, as Schaefer (2014) points out that in December 2014, only five banks in the U.S. controlled 44% of the industry's $15 trillion in assets. More recently, in 2025, the top three banking institutions amass around 40% of assets. Although in a differing degree, this market concentration process presents similar patterns in the European Union, United Kingdom and Latin America.

At the same time, central banks around the world turned to the use of the size of their balance sheets to stimulate lending in credit markets via purchases of long-term government debt. In the U. S., for example, the Federal Reserve increased the size of its balance sheet more than sixfold: total assets increased from $0.92 trillion in August 2008 to around $6 trillion in 2026[2]. Similarly aggressive balance sheet policies have been pursued by the Bank of England, European Central Bank and the Bank of Japan. [3]

These changes, both in the market structure of the banking system as well as in the tools of central banks pose several challenges for monetary policy. For instance, Bech et. al. (2014) find that the transmission mechanism of monetary policy is considerably impaired especially during episodes of economic decline associated with financial crises. This fact partially explains why central banks resorted to unconventional measures. Moreover, Boivin, Kiley and Mishkin (2011) highlight the need for further studies related to the "banking channel" of monetary policy, given the current lack of solid guidelines to empirically specify potential transmission channels.

[1] https://mail.latinometrics.com/p/profits-and-power-a51b
[2] https://www.federalreserve.gov/monetarypolicy/bst_recenttrends.htm
[3] See Meyer and Bonfim (2012), Li and Wei (2012) and Pandl (2012) for the cumulative effects of the Fed's QE programs; Bowman et al. (2011) find a positive effect of the Bank of Japan's QE policies on bank lending and Joyce and Spaltro (2014) who find similar effects of balance sheet policies in the UK.

In this way, it is pertinent to ask then, how does unconventional monetary policy impact credit market activity under different banking sector concentrations? How does it differ from the transmission mechanism of conventional monetary policy?

In this analysis, I provide answers to these questions by offering a framework that considers important aspects when modeling monetary policy. First, I have a well-defined role for financial intermediaries. As these institutions provide services that individuals cannot achieve on their own, they perform fundamental roles in the economy. Second, money is established as a medium of exchange that alleviates a trading friction in the face of imperfect information. Third, an independent monetary authority controls the rate of money growth and engages in government bond purchases. In turn, monetary policy impacts the credit market through financial intermediaries' investment allocations.

Given that the transmission mechanism of monetary policy depends on the actions of intermediaries, it is essential to have a well-defined role for banks. Particularly, this is essential to be able to understand how changes in banking market concentration modify the incentives of intermediaries to hold public and private debt liabilities. Consequently, our approach allows us to rigorously evaluate and identify what parts of the transmission mechanism of monetary policy are distorted when the CB attempts to stimulate credit market activity.

In this spirit I present an overlapping generations structure and follow Diamond and Dybvig (1983), in which financial intermediaries provide risk-pooling services that allow individuals to insure against liquidity risk. Furthermore, banking institutions also provide intertemporal consumption-smoothing services by channeling deposit funds towards loans in a credit market. Similar to Schreft & Smith (1997, 1998), limited communication and restrictions to asset portability generate a transactions role for monetary exchange.

However, our approach differs from Schreft & Smith (1997, 1998), in that the monetary authority and the fiscal authority are separate entities. Along similar lines, in our model the monetary authority rebates back only a fraction of the fiscal authority's debt expenses. Such characteristic, aside from also setting us apart from Schreft & Smith (2002), allows us to talk about true open market operations. Our work contributes to the findings by Ghossoub, Laosuthi and Reed (2006) and Laosuthi and Reed (2012) in which they analyze the effects of conventional monetary policy on the availability of credit with imperfectly competitive intermediaries and in the presence of government debt. Nonetheless, our framework differs from theirs in that the monetary authority is a separate and fiscally independent entity that conducts true open market operations. This feature is essential for the analysis of CB expansionary balance sheet policy.

Our findings confirm the distortionary effects of banking concentration in the transmission of monetary policy. Under perfectly competitive intermediation and in economies with low levels of public debt, an increase in the rate of money growth decreases interest rates and increases loan volume. This can also be the case in economies with high public debt levels only if the asset substitution effect on intermediaries' portfolios outweighs the crowding out effect of increased government debt. Similarly, under the same competitive banking sector but independently of the public debt load of the economy, CB bond purchases stimulate credit market activity by reducing interest rates and increasing loan availability.

In contrast, when the banking sector is fully concentrated, the impact of monetary policy on credit markets can be distorted. For instance, an increase in the rate of money growth fails to stimulate credit markets when the economy is subject to "high" liquidity shocks and if nominal interest rates are low. On the other hand, CB bond purchases reduce interest rates and increase loan amounts as in the competitive banking case, but the magnitude of the effect is lower under a fully concentrated banking sector if the economy has a low-interest rate environment.

Finally, the paper is organized as follows. Section 2 introduces the environment with a perfectly competitive banking sector. Section 3 analyzes the economy in the steady state in which the CB follows a money growth rule and can expand its balance sheet through open market operations. Section 4 studies the implications on monetary policy when the banking sector is fully concentrated. Section 5 studies the steady state implications of monetary policy in the presence of a monopoly bank. Section 6 compares the effects of unconventional monetary policy under different concentrations in the market for intermediation and section 7 concludes.

➲ 2. The Environment.

Time is discrete, lasts forever and indexed by $t = 1,2, \dots \infty$. The world consists of two separate but identical locations populated by two types of agents denoted as "depositors" and "borrowers". Each type is of unit-mass size and depositors are ex-ante identical. All individuals live for two periods, denoted as "young" and "old".

Depositors born at time t are endowed with $y_0 > 0$ units of a homogeneous consumption good when young and none when old. They only value consumption in their old stage according to preferences $u(c_{t+1}) = \frac{c_{t+1}^{1-\theta}}{1-\theta}$, where $\theta < 1$ is the relative risk aversion coefficient. At any period, there is a probability $\pi \in (0,1)$ that a young depositor will have to migrate to the other location. These

individuals are denoted as "movers" and the remaining as "non-movers". In contrast, borrowers are not prone to relocation risk, and they are endowed exclusively when old with $y_1 > 0$ units of the consumption good. Further, borrowers value consumption when young c_t, and old c_{t+1}, as depicted by their lifetime utility $u(c_t, c_{t+1}) = \frac{c_t^{1-\theta}}{1-\theta} + \beta \frac{c_{t+1}^{1-\theta}}{1-\theta}$, where β is the discount factor.

The banking sector is represented by perfectly competitive financial intermediaries that participate simultaneously in a deposit and in a credit market. In the market for deposits, they announce rates of return of r_t^m for movers and r_t^n for nonmovers, taking competing bank's actions as given. In the credit market, banks offer loans in amount l_t charging an interest rate of R_t per unit of the consumption good borrowed.

The existence of limited communication among banks between locations forbids the validation of privately-issued liabilities. This is not the case for fiat currency which is the only asset globally verifiable irrespective of location. This imposes a trading friction on movers as they must prematurely terminate asset investments in exchange for currency, in order to consume. In this manner, money has the role of a medium of exchange despite being return dominated by all other assets in the economy.

Relocation risk is analogous to a "liquidity-preference shock" as in Diamond and Dybvig (1983) and consequently financial intermediaries arise to provide insurance against liquidity risk. Similarly, because borrowers can take out loans to consume when young in the absence of income, intermediaries also provide intertemporal consumption-smoothing services by supplying loans in the credit market.

The fiscal authority issues debt through bond securities in nominal amount B_t, with real value $b_t \equiv \frac{B_t}{P_t}$ where P_t is the unit price of the consumption good. These liabilities offer a sure claim of R_t^b per unit of the consumption good invested in government debt. Also, the fiscal authority's income is complemented by transfers from the monetary authority every period.

A monetary authority is represented by an independent central bank (CB) that has at its disposal two monetary policy instruments. First, it regulates the money supply by adhering to the rule $M_t = \sigma M_{t-1}$, where M_t represents current nominal money balances and $\sigma > 1$ is the rate of money growth. Hence, the CB can affect the return on real money balances $m_t \equiv \frac{M_t}{P_t}$ which depend on the relative price level $\frac{P_t}{P_{t+1}}$. The second instrument denotes the size of the CB's balance sheet by engaging

in an expansionary balance sheet program through government bond purchases in nominal amount B_t^{CB}, whose real value is denoted by $b_t^{CB} \equiv \frac{B_t^{CB}}{P_t}$. Finally, the CB transfers a fraction $\lambda \in (0,1)$ of its net revenue to the fiscal authority every period.

2.1. Timing of Actions.

The sequence of actions of depositors and borrowers follows. At the start of period t, depositors are endowed with income y_0 which they fully deposit in the bank. These intermediaries invest deposits in a portfolio of bonds, cash balances and loans supplied in the credit market. Afterwards, borrowers obtain funds to consume when young by taking on loan debt from intermediaries. Then, the relocation shock is realized and due to limited communication between banks and restrictions on asset portability, moving agents cash out their deposit from the bank. At the end of this period, depositors who must relocate do so and carry money balances. Now in their old period, borrowers receive an endowment of y_1 which they consume after honoring debt payments. Similarly, non-movers claim their realized return on deposits. Finally, movers exchange cash for the consumption goods with banks and all old agents consume.

2.2. Financial Intermediation.

a) The Deposit Market.

Financial intermediaries live in a perfectly competitive market and are symmetrical across locations. In this manner, I will describe the actions of a representative bank.

Deposits are allocated through an investment portfolio of assets, while at the same time the representative bank announces interest returns on deposits of r_t^m for movers and of r_t^n for non-movers. It follows that financial intermediation allows movers to consume $c_t^m = r_t^m y_0$ if a mover and $c_t^n = r_t^n y_0$ if a nonmover.

Interest on deposits depends on the bank's investment returns coming from cash m_t, government bonds b_t^P, and loans l_t. The bank can guarantee such returns first, to movers, by holding enough currency that considers the return on money and the size of the moving population:

$$\pi r_t^m y_0 \leq m_t \frac{P_t}{P_{t+1}} \tag{1}$$

in turn, but for non-movers, interest rates on deposits are sustained by the returns coming from bonds and loan investments:

$$(1-\pi)r_t^n y_0 \leq R_t^b b_t^P + R_t l_t^S \tag{2}$$

The bank investment allocations follow a balance sheet constraint:

$$y_0 \geq m_t + l_t^s + b_t^p \tag{3}$$

Given that banks are Nash competitors, in equilibrium they offer rates of return that maximize depositor's expected utility:

$$\max_{r_t^m; r_t^n} \left\{ \frac{\pi(r_t^m y_0)^{1-\theta}}{1-\theta} + \frac{(1-\pi)(r_t^n y_0)^{1-\theta}}{1-\theta} \right\} \tag{4}$$

subject to (1)-(3).

As a result, the bank will hold a proportion of deposits as currency reserves which are decreasing in the opportunity cost of holding money, reflected by inflation and the return on loan investment:

$$\gamma_t \equiv \frac{m_t}{y_0} = \frac{1}{1 + \left(\frac{1-\pi}{\pi}\right)\left(R_t \frac{P_{t+1}}{P_t}\right)^{\frac{1-\theta}{\theta}}} \tag{5}$$

Equation (5) describes the optimal risk-sharing condition that allows banks to provide insurance against a random demand for currency.

Also regarding the bank's first order conditions, a no-arbitrage relationship holds:

$$R_t = R_t^b \tag{6}$$

which establishes that the cost of private funds must equal that of public debt as banks exploit all profit opportunities to attract depositors.

b) The Credit Market.

Borrowers are endowed only when old with y_1 units of consumption goods. The fact that they value consumption when young and old makes these individuals seek consumption-smoothing

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opportunities. Hence, these agents will finance their consumption when young by taking out default-free loans in amount l_t^d at an interest rate of R_t in a credit market such that:

$$\max_{l_t^d} \left\{ \frac{\left(l_t^d\right)^{1-\theta}}{1-\theta} + \beta \frac{\left(y_1 - R_t l_t^d\right)^{1-\theta}}{1-\theta} \right\} \tag{7}$$

which yields the loan demand function that is increasing in income and decreasing in the cost of borrowing:

$$l_t^d = \frac{y_1}{(\beta R_t)^{\frac{1}{\theta}} + R_t} \tag{8}$$

The market for loans clears so that:

$$l_t^s = l_t^d \tag{9}$$

for all $t \geq 0$.

2.3. The Central Bank.

The CB controls the rate of money growth σ, which generates inflation tax proceeds or seigniorage revenue in amount $\left(\frac{\sigma-1}{\sigma}\right) m_t$ every period. Additionally, the CB engages in a government security purchase program by acquiring bonds in amount b_t^{CB} and collecting investment revenue from the returns on previously issued bonds in amount $R_{t-1}^b b_{t-1}^{CB}$. Thus, the CB resource constraint is depicted by:

$$R_{t-1}^b b_{t-1}^{CB} + \left(\frac{\sigma-1}{\sigma}\right) m_t - b_t^{CB} > 0 \tag{10}$$

The CB's net income is strictly positive as it can control seigniorage revenue in order to avoid any losses. Finally, every period, the CB transfers a fraction $\lambda \in (0,1)$ of its net resources to the fiscal authority. These transfers allow monetary policy to influence the impact of public debt in the economy.

2.4. The Fiscal Authority.

Part of the fiscal authority's income stream comes from the sale of bonds b_t every period. These debt liabilities are purchased by private investors and the monetary authority such that the market for public debt clears:

$$b_t = b_t^{CB} + b_t^P \tag{11}$$

for all $t \geq 0$.

The remaining income resources of the fiscal authority come from CB transfers which consist of a fraction λ of the monetary authority's net receipts generated through monetary policy operations. In turn, debt payments on previously issued debt constitute the expense side of the fiscal authority's budget constraint, so that under a balanced budget:

$$R_{t-1}^b b_{t-1} = b_t + \lambda \left[R_{t-1}^b b_{t-1}^{CB} + \left(\frac{\sigma - 1}{\sigma} \right) m_t - b_t^{CB} \right] \tag{12}$$

➲ 3. Steady State Analysis.

The steady state properties of the economy follow. First, by (6) and (8) I construct the no arbitrage locus:

$$l = \frac{y_1}{[\beta R^b]^{\frac{1}{\theta}} + R^b} \tag{13}$$

which inversely relates loan demand with bond interest rates by imposing no arbitrage between the returns to private and public debt.

Next, I obtain a second steady state relationship. Note that in a steady state equilibrium $P_{t+1}/P_t = \sigma$ so that using (5) and (11) into (12) yields:

$$b^P = \lambda \left(\frac{\sigma - 1}{\sigma} \right) \left[\frac{\gamma(R, \sigma) \cdot y_0}{R^b - 1} \right] - (1 - \lambda) b^{CB} \tag{14}$$

The expression in (14) illustrates how CB bond purchases impact private bond holdings which are also influenced by the net lending position of the fiscal authority. For instance, when $R^b - 1 > 0$, net real interest rates are positive, which implies that the fiscal authority is a net borrower: $b^p > 0$. In this case, an increase in CB bond purchases reduces the amount of public debt in private hands which ameliorates the crowding out effect of government debt, allowing loan investment to increase. In the case where $R^b - 1 < 0$, net real interest rates are negative, and the fiscal authority is a net lender: $b^p < 0$. Thus, through bond purchases, the CB is effectively lending resources to the fiscal authority that translate into a higher level of fiscal subsidies to the private sector. It is also important to note that the impact of monetary policy in stimulating credit market activity increases as the proportion of CB transfers decreases. This fact indicates the importance of the CB's fiscal independence.

I now obtain a third steady state relationship by substituting the value of b^p in (14) into the bank's balance sheet constraint in (3) and using (6) to obtain an expression for the steady state loan level:

$$\frac{l}{y_0} = 1 - \gamma\left(R^b, \sigma\right)\left[1 + \frac{\lambda\left(\frac{\sigma - 1}{\sigma}\right)}{R^b - 1}\right] + (1 - \lambda)\frac{b^{CB}}{y_0} \tag{15}$$

The equation above illustrates important facts about lending in the economy. For instance, higher borrowing costs are reflected by an increase in R^b, positively impact loan availability. This expression also illustrates how CB bond purchases increase the fraction of loan to deposits where the magnitude of this effect is determined the degree of transfers to the fiscal authority.

Next, I will offer conditions for a steady state to exist.

Proposition 1. (Existence of Multiple Steady States)*. Assume (10) holds and let* $\hat{l} \equiv [1 - \pi(1 - \lambda)]y_0 + (1 - \lambda)b^{CB}$*. Further, assume that borrower's endowments when old are such that:*

$$\frac{y_1}{y_0} > \left[\left(\frac{\beta}{\sigma}\right)^{\frac{1}{\theta}} + \frac{1}{\sigma}\right]\left[1 + (1 - \lambda)\left(\frac{b^{CB}}{y_0} - \pi\right)\right]$$

Under these conditions, multiple steady-state equilibria exist. In one, the fiscal authority is a net borrower and credit market activity is low; in the other, the fiscal authority is a net lender, and the economy exhibits a high degree of credit market activity.

3.1. Comparative Statics.

a) Money Growth Rule.

Next, I will study the effects of monetary policy in a steady state. Starting with money supply in the economy, the impact of an increase in the rate of money growth is summarized by the following proposition:

Proposition 2. (Increase in the Rate of Money Growth under Perfectly Competitive.

Banking). *Assume that* $r^b > \lambda\left(\frac{\sigma-1}{\sigma}\right)$ *and that multiple steady state equilibria exist, then: i. When the fiscal authority is a net lender:* $\frac{dl}{d\sigma} > 0, \frac{dR^b}{d\sigma} < 0, \frac{dR}{d\sigma} < 0$. *ii. When the fiscal authority is a net debtor:* $\frac{dl}{d\sigma} > 0, \frac{dR^b}{d\sigma} < 0, \frac{dR}{d\sigma} < 0$*, only if intermediaries' asset substitution effect dominates the distortionary effect of government debt, otherwise:* $\frac{dl}{d\sigma} < 0, \frac{dR^b}{d\sigma} > 0, \frac{dR}{d\sigma} > 0$.

Increases in the rate of money growth generate two opposing effects. The first has to do with the crowding out effect of government debt. As higher rates of money growth erode the real value of bonds, the fiscal authority has to offer higher returns for the bond market to clear as implied by (11). Thus, the fiscal authority issues more debt which further crowds out loan investment. The second effect is determined by an asset substitution effect in intermediaries' portfolios. In this case, inflation deteriorates the value of money, and, to maximize the utility of its depositors, the bank will allocate more resources into loans. This effect also implies that increases in the rate of money growth reduce the seigniorage tax base which also reduces the fiscal authority's ability to issue debt. It is also important to highlight that the magnitude of this effect also depends on the risk aversion of a representative depositor. That is, lower risk aversion makes individuals care less for a "balanced" expected utility, causing intermediaries to destine more resources towards higher consumption states. Indeed, such a state comes to bear if the depositor becomes a non-mover: consumption does not depend on the return to money as depicted in (2). This fact further increases intermediaries' incentives to reduce cash holdings in favor of loan investment.

By comparison, in the economy with a higher level of credit market activity, the fiscal authority is a net lender and thus higher rates of money growth yield increased seigniorage transfers that allow the fiscal authority to enhance subsidies to the private sector. These resources find their

way into loan investment that by (9) reduce the cost of private borrowing and ultimately increase lending volume.

b) Bond Purchase Program.

The effect of government security purchases is summarized in the following proposition:

Proposition 3. (Bond Purchases under Perfectly Competitive Banking)*. Assume that* $r^b > \lambda\left(\frac{\sigma-1}{\sigma}\right)$ *and that multiple steady state equilibria exist. Then, irrespective of the fiscal authority's net lending position:* $\frac{dl}{db^{CB}} > 0, \frac{dR^b}{db^{CB}} < 0, \frac{dR}{db^{CB}} < 0$.

When the CB engages in a bond purchase program, it increases the number of resources to the fiscal authority via transfers. However, unlike resources coming from an increase in the rate of money growth, the CB keeps a fraction $1 - \lambda$ of outstanding bonds causing fiscal liabilities to also increase.

When the fiscal authority is a net borrower, CB bond purchases reduce intermediaries' investment opportunities in public debt. Even though there is also transferred income to the fiscal authority, the ultimate outcome is a decline in bond supply for private investors which shifts deposit allocations toward loan investment. For the credit market to clear, the cost of private and public borrowing must go down by condition (9).

If the fiscal authority is a net lender, open market operations are effectively lending low-cost resources to the fiscal authority. This enhances subsidies to the private sector which allows intermediaries to increase loans. As a result, the cost of borrowing declines by loan market clearing and credit market activity increases.

➲ 4. A Monopoly Bank.

I now will focus on an economy in which a single intermediary constitutes the entire financial sector.

Our analysis so far has shown that competition in the banking system has important implications for the transmission mechanism of monetary policy. Moreover, the transmission mechanism of monetary policy is (potentially) distorted by the crowding out effects of government

debt in the case of an increase in the rate of money growth. When the banking sector is fully concentrated, there is another distortion in this mechanism as now the monopoly bank can behave strategically by exercising market power. As the sole intermediary that provides risk-sharing and consumption-smoothing services, it controls the allocation of deposits in order to charge interest rates that extract the maximum amount of surplus in the credit market. Furthermore, the monopoly bank utilizes government bonds as another source of revenue, further putting downward pressure on cash reserves and to the detriment of risk-sharing. It follows that the monopoly bank simultaneously distorts both deposit and credit markets which has important implications for the impact of monetary policy.

When the banking sector is perfectly competitive, intermediaries invest in money balances according to an optimal risk-sharing condition. They also invest in loans and bonds up to the point at which no arbitrage guarantees the maximum return on debt investment for its clients. As opposed to this scenario, a monopoly bank will choose the amount of assets and the rates of return on loans that extract the maximum amount of surplus from its depositors taking the return to government debt as given:

$$\max_{r_t^m; r_t^n; l_t; b_t^p; m_t} \left\{ R(l_t) l_t + R_t^b b_t^p + m_t \cdot \frac{P_t}{P_{t+1}} - \pi r_t^m y_0 - (1-\pi) r_t^n y_0 \right\}. \tag{16}$$

However, the bank must offer returns on deposits that guarantee a baseline expected utility level $\bar{u}$ that makes individuals indifferent between participating in the financial system and autarky:

$$\frac{\pi (r_t^m y_0)^{1-\theta}}{1-\theta} + \frac{(1-\pi)(r_t^n y_0)^{1-\theta}}{1-\theta} \geq \bar{u}. \tag{17}$$

Given that money is dominated in rate of return, the bank will hold money balances and guarantee returns to movers such that:

$$\pi r_t^m y_0 = m_t \cdot \frac{P_t}{P_{t+1}} \tag{18}$$

In contrast, it will extract all possible surplus from investment in loans and government debt offering returns to non-movers that satisfy:

$$(1-\pi) r_t^n y_0 < R(l_t) l_t + R_t^b b_t^p \tag{19}$$

subject to a balance sheet constraint:

$$y_0 = m + l_t + b_t^p \tag{20}$$

The bank must also make sure that depositors do not lie about their type in attempting to get higher returns on their deposits. Thus, it must make sure that the following incentive-compatibility constraint on returns holds:

$$r_t^n \geq r_t^m \tag{21}$$

Notice that the bank's problem can be reduced to choosing the amount of loans and bonds given that cash is return-dominated and therefore it is a residual investment:

$$\max_{r_t^n; l; b_t^p} \left\{ R(l_t) l_t + R_t^b b_t^p - (1-\pi) r_t^n y_0 \right\}$$

subject to (19)-(21).

The solution to the bank's problem implies that the optimal amount of loans l_t^* and bonds b_t^* will be such that the marginal benefit from both investments is the same:

$$R_t^b = R_t'(l_t^*) l_t + R_t(l_t^*). \tag{22}$$

Recall that in a competitive banking sector, intermediation results in a no-arbitrage condition in which the cost of public and private borrowing is the same: $R_t^b = R_t$. In contrast, expression (22) highlights the fact that the bank's market power allows it to charge higher interest rates in the credit market, making the cost of private sector funding to be greatern than that of public funds. Such a gap allows the bank to extract the maximum amount of surplus in both types of debt markets given that it faces a downward demand curve.

Also from the bank's first order conditions, the amount of money that the bank will hold is completely residual after choosing a combined amount of loans and bonds that solve (22) and follow:

$$m_t = y_0 - \left(l_t^* + b_t^{p*} \right)$$

where:

$$\gamma_t^M \equiv \frac{m_t}{y_0} = \frac{P_{t+1}}{P_t} \cdot \left[\frac{\bar{u}(1-\theta)/\pi^{\theta}}{1 + \left(\frac{1-\pi}{\pi}\right)\left(\frac{P_{t+1}}{P_t} \cdot R_t\right)^{\frac{1-\theta}{\theta}}} \right]^{\frac{1}{1-\theta}} . \tag{23}$$

➲ 5. Steady State Analysis.

The analysis of the economy in the steady state follows. The next proposition determines the conditions for the existence of a steady state:

Proposition 4. (Existence of Multiple Steady-States under Fully-Concentrated Banking). *Let* $y_d \equiv [\bar{u}(1-\theta)]^{\frac{1}{1-\theta}}\left[(1-\pi)^{\frac{1+\theta}{1-\theta}} + \pi\right]$ *and* $\theta = \frac{1}{2}$. *Also, let* $\underline{l} \equiv y_0 - [\bar{u}(1-\theta)]^{\frac{1}{1-\theta}}\pi\sigma$ *and assume that* $y_0 > y_d$. *Then, if endowments of old borrowers are such that:*

$$y_1 > max\left\{[y_0 - (\bar{u}/2)^2\pi\sigma][(\beta/\sigma)^2 + \sigma^{-1}], \frac{y_0 + (1-\lambda)(b^{CB} - \pi y_0)}{\beta[(\sigma+\beta^2)^{1/2} - 2\beta]}\right\},$$

multiple steady-state equilibria exist in which a fully concentrated banking system coexists with a fiscal authority that is a net lender in one equilibrium and a net borrower in the other.

The first assumption on the endowment of depositors guarantees that the monopoly bank is earning positive profits in equilibrium. Moreover, this condition allows the bank to be profitable while making sure that the incentive compatibility constraint in (21) holds: $l > \underline{l}$.

The second assumption on the endowment of old borrowers establishes that money is dominated in rate of return by loans and as well as by bond investments. This condition assures that independently of the fiscal authority's net lending position, there will an equilibrium in the credit market.

In this case, I also obtain two relationships that along with the bank's choice of loans determine the amount of loans in a steady state equilibrium. The first one is similar to expression (15) but with cash holdings determined by (23):

$$\frac{l}{y_0} = 1 - \gamma^M\left(R^b, \sigma\right)\left[1 + \frac{\lambda\left(\frac{\sigma - 1}{\sigma}\right)}{R^b - 1}\right] + (1 - \lambda)\frac{b^{CB}}{y_0} \tag{24}$$

The second relationship is a no-arbitrage condition depicted by:

$$l = \frac{\left(1 + 2\beta^2 R^b\right)\beta y_1}{[R^b(1 + \beta^2 R^b)]^{\frac{1}{2}}} - 2\beta^2 y_1 \tag{25}$$

5.1. Comparative Statics.

Next, I analyze the effects of monetary policy on the credit market by starting with changes in the CB's money growth rule and afterwards discussing the implications of a bond purchase program.

a) Money Growth Rule.

I first will discuss the effect of an increase in the rate of money growth on the amount of lending volume in the economy.

Proposition 5. (Increase in the Rate of Money Growth under Fully-Concentrated Banking)*. Let* $I \equiv \sigma R^b$ *and* $\bar{I} \equiv \frac{\pi}{1-\pi}$*. Then, in response to an increase in the rate of money growth:*
i. $\frac{dl}{d\sigma} > 0, \frac{dR}{d\sigma} < 0, \frac{dR^b}{d\sigma} < 0$*, if the size of the liquidity shock is such that* $\pi \leq \frac{1}{2}$ *or, if* $\pi > 1/2$ *and* $I > \bar{I}$*.*
ii. $\frac{dl}{d\sigma} < 0, \frac{dR}{d\sigma} > 0, \frac{dR^b}{d\sigma} > 0$*, if the size of the liquidity shock is such that* $\pi > 1/2$ *and* $I < \bar{I}$*.*

This proposition illustrates the strategic behavior of the monopoly bank relative to the competitive banking case. An increase in the rate of money growth decreases the value of money and absent any asset reallocations by banks, less risk-sharing is available for depositors. In a perfectly competitive banking sector, intermediaries reduce their cash reserves by investing more resources into higher-yielding assets such as loans and bonds, in aim of maximizing their client's expected utility. The monopoly bank will also rebalance deposit allocations but in contrast, it may increase the

amount of risks haring and reduce loan investments that increase the cost of borrowing. This is because in order keep distorting the credit and bond markets, the bank needs to maintain the size of its deposit base. Unlike the competitive banking sector, depositors are not being compensated as much (ex-ante) with higher-yielding asset substitutions when risk sharing declines. This fact affects their incentives to participate in the financial system. As a result, the monopoly bank will adjust the level of risk sharing by considering the tradeoff between a reduction in the size of its deposit base and the opportunity cost of cash as implied by nominal interest rates.

Also, proposition 5 suggests that when the fiscal authority is a net borrower, an increase in the rate of money growth can magnify the crowding out effect of government debt under an economy with high liquidity shocks and low interest rates. This contrasts with the competitive banking case in which the asset substitution effect is always counter to government debt distortions when the CB increases the rate of money growth.

For the case in which the fiscal authority is a net lender and under a similar, high liquidity shock and low-interest rate economy, the distortions on the transmission mechanism of monetary policy prevail. In this case however, a fully concentrated banking sector compromises the ability of the fiscal authority to subsidize credit market activity. That is, the monopoly bank dedicates these low-cost resources coming from the fiscal authority towards cash reserves in an attempt to maintain the size of its deposit base. This is in detriment of a higher loan supply and causes even higher interest rates. This potential outcome of an increase in the rate of money growth when the fiscal authority is a net lender, is in stark contrast to the case of a competitive banking sector.

b) Bond Purchase Program.

The impact of an increase in the size of the CB's balance sheet on credit markets is summarized in the following proposition:

Proposition 6. (Bond Purchases under Fully Concentrated Banking). *Irrespective of the net lending position of the fiscal authority:* $\frac{dl}{db^{CB}} > 0, \frac{dR}{db^{CB}} < 0, \frac{dR^b}{db^{CB}} < 0$.

For the case in which the fiscal authority is a net borrower, CB bond purchases translate into greater income for the fiscal authority. Consequently, the fiscal authority doesn't need to pay as much on bonds so that the return to these securities decreases. This CB action also causes the supply of bonds for private investment to decrease, consequently, opportunities and returns from public debt

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investment decline, the monopoly bank adjusts its portfolio to maintain maximal profit levels. As I describe this process, first note that the marginal benefit of bond investment, or R^b, has declined. Because the monopoly bank operates in the elastic part of the demand curve and chooses l and b^p up until their marginal benefit is the same, it will increase its loan supply to the credit market up until these marginal conditions are again equal. Because the bank faces a downward-sloping loan demand curve, for this process to take place, the cost of private borrowing must go down. After achieving its profit-maximizing loan supply, the remaining resources will be destined towards cash balances.

When the government is a net lender to the private sector, aside from reducing the supply of government debt, CB bond purchases represent low-cost lending to the fiscal authority. This implies that the fiscal authority does not have to pay as much for its debt liabilities or equivalently, the cost of servicing its debt declines. This translates into increased subsidies to the private sector. From the bank's perspective, the net marginal benefit of bond holdings has gone up, which makes investment in these securities more attractive. However, as the CB reduces the supply of bonds that would otherwise end up in private hands, the bank will reallocate its deposit income to greater loan investments up until the marginal benefit of loans and bonds is the same. The remaining deposit income will again go towards cash holdings.

Thus, CB bond purchases stimulate credit market activity not only by reducing the distortionary effects of government debt but also by reducing the credit market distortions that come about from the existence of market power in the financial system. This is reflected by a greater lending volume and lower loan interest rates as well as by a reduction in the "gap" between private and public borrowing costs. Moreover, this policy improves risk-sharing by increasing liquidity in the economy despite the presence of fully concentrated banking. That is, as the monopoly bank can extract surplus from its depositors and borrowers, it is better off moving away from low-yield short-term cash investments as much as possible and allocating more resources into longer-term investment projects. Interestingly, CB bond purchases counter such outcome by aligning the bank's distortionary incentives to ultimately favor higher cash investments while at the same time increasing longer-term credit market activity.

6. Discussion.

Now I analyze the differences and similarities of the effects of this policy when there is a perfectly competitive versus a fully concentrated banking sector. First, and irrespective of intermediaries' industrial organization, in the economy with low credit market activity, CB bond purchases cause banks to destine more resources into loans and cash balances. However, when banks lack market power, the only existing distortion in the credit market comes from government debt. Thus, CB bond purchases work by countering such distortion so that banks reallocate resources as dictated by optimal risk-sharing and maximum expected returns to depositors. In this case, the result of monetary policy is a higher level of risk-sharing and expected consumption levels for depositors as well as increased consumption-smoothing opportunities for borrowers. In contrast, under fully concentrated intermediation, the impact of CB purchases faces and additional distortion coming from the bank's strategic behavior. Specifically, I have shown that under this monetary policy, even though lending activity increases, the bank has no incentives to provide loans beyond the point at which it is extracting the most surplus from its depositors. As investment in cash is residual, risk-sharing in the economy ceases to be optimal but just enough to incentivize participation in the deposit market. Furthermore, the existence of an interest rate gap between private and public borrowing persists, which indicates unused investment opportunities in stark contrast to the competitive case.

In the economy with high credit market activity, it was seen that CB bond purchases stimulate the credit market regardless of the competitive structure of the banking system. Nonetheless, the distortionary effects of the price-setting behavior of the financial intermediary persist despite the complementarity of government subsidies to the private sector. Again, as in the alternate economy, this leads to a reduced impact of monetary policy manifested by comparatively inferior levels of risk-sharing for depositors and lower consumption-smoothing opportunities for borrowers.

7. Conclusions.

The recent financial crisis forced central banks around the world to resort to unconventional policy instruments. A noticeable example was the unprecedented expansion in the size of their balance sheets through the purchase of government securities. At the same time, the market concentration in the banking systems of major economies accelerated. In this paper, I analyze the implications of competition in the banking sector for the ability of expansionary balance sheet policies to affect credit market activity. Under this objective I also explore conventional instruments such as

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a rate of money growth. Specifically, I analyze this issue in a framework in which banks simultaneously offer risk-sharing and intertemporal consumption-smoothing services in the presence of government debt. Our results suggest that under perfectly competitive banks, increased rates of money growth reduce interest rates and increase loan volume. This also holds in high debt economies if the crowding out effect of government debt is low. Similarly, central bank bond purchases unambiguously promote credit market activity. In contrast, under a monopoly bank, higher rates of money growth reduce funding costs and promote lending except for when the opportunity cost of money is low and liquidity shocks are of considerable magnitude. Further, bond purchases by the central bank unambiguously stimulate credit activity but the effect is lower relative to perfectly competitive banks if the economy is under a low-interest rate regime.

This analysis highlights the need for further studies in the transmission mechanism of unconventional monetary policy given the ongoing levels of banking market concentration. Given that I present a framework in which there is a well-defined role for intermediaries, our approach can be used as a steppingstone to answer other aspects that shed light on the conduct of unconventional monetary policy. For example, the role of bank competition on the impact of monetary policy in corporate credit markets is of interest. Another interesting issue relevant to international monetary policy coordination, would be the cross-border effects of monetary policy under changes in the industrial organization of the banking sector.

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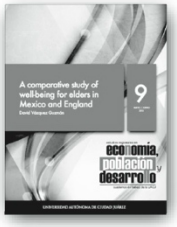

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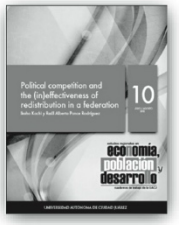

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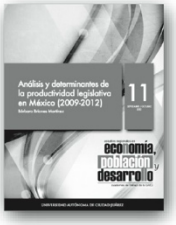

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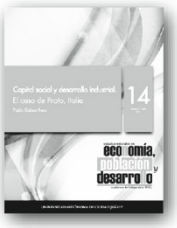

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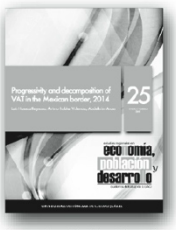

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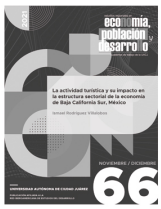

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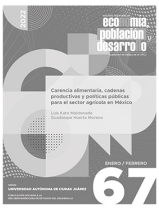

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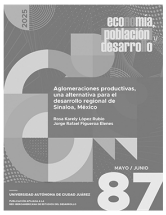

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Estructura del orden económico y político regional en el valle poblano - tlaxcalteca en México durante el periodo postravolucionario
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Un enfoque macroindustrial y financiero (1929-2010), México, Fondo de Cultura Económica.
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Castillo, Manuel Ángel (2003). "La política de inmigración en México: un breve recuento", en Manuel Ángel Castillo, Alfredo Lattes y Jorge Santibáñez (coords.), Migración y fronteras, Tijuana, El Colegio de la Frontera Norte / Asociación Latinoamericana de Sociología / El Colegio de México, pp. 425-451.

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