



# Competition among banks and the pass-through of monetary policy<sup>☆</sup>

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## ABSTRACT

This paper introduces monopolistically competitive financial intermediaries into the New Keynesian DSGE setting. Modelling bank market power explicitly contributes to understanding two empirical facts: (i) The short-run transmission of changes in money market rates to bank retail rates is far from complete and heterogeneous. (ii) Stiffer competition among commercial banks implies that loan rates correlate more tightly with the policy rate. In my model, the degree of monopolistic competition in the banking sector has a sizeable impact on the pass-through of changes in the policy rate. In particular, a more competitive market for bank credit amplifies the efficiency of monetary policy.

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## 1. Introduction

The present paper examines the impact of an explicitly modelled banking sector on the transmission of monetary policy shocks. Drawing on [Goodfriend and McCallum \(2007\)](#), I introduce a continuum of monopolistically competitive financial intermediaries whose products are imperfect substitutes. Just like price-setting goods producers, commercial banks can thus determine the retail interest rates on their deposits and loans.

There is ample empirical evidence that the pass-through from monetary policy to bank retail rates is incomplete, at least in the short run. Both loan and deposit rates are found to adjust sluggishly to changes in market interest rates (see e. g. [Cottarelli and Kourelis, 1994](#), [Berlin and Mester, 1999](#), and [de Bondt, 2005](#)).<sup>1</sup> Retail rate adjustment costs are a plausible explanation for this behaviour

([Hofmann and Mizen, 2004](#)), as the long-run pass-through is typically estimated to be higher, or almost complete.<sup>2</sup>

In spite of the consensus view that the extent of stickiness differs between countries and bank product categories, the causes are still up for debate. Starting from the seminal theoretical contribution of [Klein \(1971\)](#), a strand of the empirical literature has focused on the relationship between bank competition and monetary transmission. [Hannan and Berger \(1991\)](#) find that deposit rates adjust significantly more sluggishly in concentrated markets, especially when money market rates are rising.

[van Leuvensteijn et al. \(2008\)](#) analyse the impact of loan market competition on bank rates in the euro area between 1994 and 2004. They find that stronger competition implies lower interest differentials between bank and market rates for most loan products. Moreover, the responsiveness of retail rates to changes in market interest rates is positively correlated with the extent of competition. This agrees with evidence from prior studies using different measures of competition or concentration, including [Cottarelli and Kourelis \(1994\)](#), [Borio and Fritz \(1995\)](#), and [de Bondt \(2005\)](#).<sup>3</sup>

Empirically, stiffer competition from other banks or the capital market seems to speed up the adjustment of retail rates to changes in money market conditions. According to [Lago-González and Salas-Fumás](#)

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<sup>1</sup> See also [Kok Sørensen and Werner \(2006\)](#) for further euro area evidence and a comprehensive survey of the related literature.

<sup>2</sup> Implicit risk-sharing agreements ([Berger and Udell, 1992](#)), where banks shield their customers from fluctuations in market interest rates, and relationship banking ([Berger and Udell, 1995](#)) are alternative explanations not considered in this paper.

<sup>3</sup> Certainly, monopolistic competition is just one of several explanations for the observed heterogeneity in interest rate pass-through, but a comparatively robust one (see [Sørensen and Werner, 2006](#)).

(2005), a mixture of bank market power and adjustment costs can account for the observed rigidity in retail rates.

Introducing monopolistic competition among banks into a New Keynesian DSGE model entails an under-provision of deposits and credit contracts, relative to the perfect competition scenario, in the long run. More importantly, the model replicates the incomplete pass-through from the policy rate to deposit and loan rates. Sluggish adjustment of deposit rates amplifies changes in private households' liquidity premium and thus the fluctuations in output, consumption, and employment at business cycle frequencies.

On the contrary, sticky interest rates on loans attenuate the deviations of investment and employment from their steady-states, due to a cost channel for monetary policy. Monopolistic competition in the market for firm credit represents a significant bottleneck in this model, that reduces the efficiency of monetary policy.

Goodfriend and McCallum (2007) study the dynamic implications of Goodfriend (2005) in a calibrated DSGE model. In order to provide loans, the financial sector uses collateral and monitoring effort, while bank deposits are a prerequisite for facilitating transactions. The authors identify two opposing effects of corporate banking: On the one hand the well-known “financial accelerator” introduced by Bernanke et al. (1999), which results from a drop in the value of collateral under adverse economic conditions, on the other hand a “banking attenuator” arising from a fall in consumption and the consequent rise in collateral-eligible assets during a recession.

Following up on Goodfriend and McCallum (2007), my model evolves from a two-sector economy with goods production and banking. Firms use labour and capital to produce a diversified output which is sold in a monopolistically competitive market. They cannot retain earnings, but accumulate productive capital through investment. Returns accrue at the end of a period, while the wage bill and investment are paid up front. Firms must therefore pre-finance their working capital by a one-period bank loan.

Commercial banks provide two types of financial intermediation. They combine collateral, consisting of a borrower's productive capital stock and end-of-period profits, with monitoring effort to produce loans. Since monitoring is costly, banks demand an *external finance premium (EFP)* on top of the risk-free reference rate. They moreover collect deposits from private households. Due to administrative costs, deposits are an imperfect substitute for high-powered central bank money from a bank's perspective. Accordingly, they yield a return below the monetary policy rate. In line with Stracca (2007), I refer to this interest rate differential as the *liquidity or inside money premium (IMP)*.

Heterogeneity of financial contracts generates an imperfectly competitive market pattern, where both the steady states and dynamics of the above spreads are affected by the extent of bank competition as well as standard arguments in the marginal costs of deposit and loan provision. By widening the spreads between policy and retail rates beyond these costs, commercial banks realise a positive expected net profit.

This paper attempts to overcome the absence or passivity of financial intermediaries in most models. By allowing banks to set interest rates optimally, subject to quadratic adjustment costs à la Rotemberg (1982), I add a micro-founded imperfection to the transmission mechanism of monetary policy.

Recently, a limited number of papers have approached the question of incomplete interest rate pass-through and monopolistic competition among banks in a general equilibrium framework. Among them, the contributions of Scharler (2008), Hülsewig et al. (2009), and Gerali et al. (2008, 2010) are most closely related to my work.

Scharler (2008) analyses the implications of limited pass-through from market to both loan and deposit retail interest rates for macroeconomic volatility in a calibrated sticky price model. Incomplete pass-through arises from the introduction of intermediation costs which provide an incentive for banks to smooth retail interest rates even within a perfectly competitive financial sector.

Hülsewig et al. (2009) analyse the role of loan market frictions in the propagation of monetary policy shocks. They combine sticky loan interest rates à la Calvo (1983) with monopolistic competition of the same functional form used in this paper. While the authors comment on the immediate and long-run effects of monopolistic competition on the pass-through of monetary policy shocks in proposition 2.2, the corresponding sensitivity parameter is dropped in the empirical analysis where they focus on the role of incomplete interest rate pass-through for the cost channel of monetary policy transmission.

Gerali et al. (2010) develop a financially rich model and estimate it on euro area data. Their banking sector also features interest rate adjustment costs and monopolistic competition in loan and deposit markets. As opposed to my model, their wholesale interest rates will be identical to the monetary policy rate in the long-run equilibrium without shocks.<sup>4</sup> As a consequence, the entire steady-state spread between the monetary policy rate and bank retail rates necessarily arises from monopolistic competition. While this comprehensive framework allows the authors to address numerous interesting questions, especially in relation to the recent financial turmoil, the role of monopolistic competition among banks is not tracked down in their analysis.

My work contributes to the above line of research by analysing precisely the quantitative importance of imperfect competition in the markets for bank products on the transmission of monetary policy shocks, given a *constant* degree of interest rate stickiness. For this purpose, I use a calibrated New-Keynesian DSGE model.

The rest of the paper is organised as follows. Section 2 describes the model. In Section 3, I derive the intertemporally optimal behaviour of banks and the symmetric equilibrium. The calibration of parameters and steady-state results are presented in Section 4. Section 5 analyses the dynamic implications of bank competition for the responses to an expansionary monetary policy shock. Section 6 concludes.

## 2. The model

The model is set up in discrete time and features a representative private household, a representative final goods producer, a continuum of intermediate goods-producing firms, a continuum of financial intermediaries, and a monetary authority.

At the beginning of period  $t$ , intermediate goods producers take out a short-term bank loan to hire labour and to invest into new capital which is productive as of period  $t+1$ . By means of the borrowed working capital, firms produce a differentiated intermediate output that is traded in a monopolistically competitive market.

Banks produce these loans from two substitutable input factors: collateral and labour to screen and monitor borrowers. Since only monitoring is costly, higher collateral reduces the cost of providing a loan and thus the loan interest rate demanded by the bank.

A representative final goods producer merges the continuum of intermediate goods into a final good that can be either invested by firms or consumed by the household. The market for final output is perfectly competitive and yields zero profit.

The central bank provides private banks with high-powered money in exchange for risk-free bank bonds which yield a return equal to the central bank-determined policy rate. Monetary policy follows a standard Taylor rule.

The representative household supplies two types of homogeneous labour – work and monitoring effort – to firms and banks, respectively. The real wage is identical across sectors. A constraint requires the household to hold bank deposits for transactions.

Imperfectly competitive agents extract monopolistic rents which are redistributed to the owner, the representative household, at the end of period. Likewise, the household receives the central bank's

<sup>4</sup> Gerali et al. (2010) model each bank as a composition of one “wholesale” branch and two “retail” branches with monopolistic competition in the market for deposits and loans, respectively.

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