



# Loan interest rate pass-through and changes after the financial crisis: Japan's evidence<sup>☆</sup>



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## ABSTRACT

We estimate interest rate pass-through in the loan market using an individual bank-based panel dataset from Japan. Previous studies using data from European countries have presented a number of common findings, including that banks with a high proportion of relationship lending tend to set lower pass-through. In this respect, we have obtained similar results using a dataset for Japan going back to the early 2000s. We further examine the influence of borrowing firms' balance sheet characteristics on loan interest rate pass-through, and find that these additional factors are also important determinants for pass-through dispersion. However, after the recent global financial crisis, even banks with a high proportion of relationship lending have largely lowered loan interest rates by raising pass-through, and pass-through has not necessarily been determined in accordance with borrowing firms' balance sheet characteristics. These results differ from those of recent studies on European countries. Possible background factors explaining this change are that (i) pressure to lower loan interest rates has risen due to extensive monetary easing and greater lending competition among banks, while Japan's banking system as a whole has maintained its resilience in the post-crisis period; (ii) demand for bank loans has increased substantially due to disruptions in the market for alternative funding sources, such as commercial paper and corporate bonds; and (iii) public measures to increase bank loans have been broadly introduced in Japan.

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## 1. Introduction

Banks' loan interest rate setting determines profitability from their core business and ultimately impacts on the stability of their financial basis through their accumulation of capital. Therefore, one of the most important decisions made by individual banks is the loan interest rates they set. In addition, because the bank lending channel plays a central role in a bank-oriented financial system like Japan's, how banks set their loan interest rates is an important determinant of the effectiveness of monetary policy. For these reasons, analyzing banks' loan interest rate setting behavior seems to

be of benefit both for monitoring bank operations and for understanding monetary policy transmission channels.

In many existing studies, banks' loan interest rate setting behavior is investigated from the interest rate pass-through perspective, which examines the responsiveness of loan interest rates to market interest rate variations such as changes in banks' funding costs in interbank markets. This reflects the well-known fact that banks' loan interest rates tend to respond gradually to changes in market interest rates, which suggests the presence of a degree of stickiness in loan interest rates. The absence of complete pass-through – at least in the short-run – implies that in the face of increasing market interest rates, banks attempt to limit rises in borrowing firms' funding costs for various reasons, even if such behavior reduces their interest rate spreads on loans.

Most empirical studies that employ individual bank-level data to estimate interest rate pass-through in loan markets have been conducted in European countries. Representative investigations have been carried out by Weth (2002), Graeve et al. (2007), Gambacorta (2008), and Horváth and Podpiera (2009), who respectively use datasets from Germany, Belgium, Italy, and the Czech Re-

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public.<sup>1</sup> These studies share the two following common features. First, they focus on heterogeneity in interest rate pass-through among individual banks, and take account of individual banks' transaction structures (such as relationship banking and monopolistic power in loan markets) and banks' balance sheet characteristics (such as asset size, bank capital, and liquidity).<sup>2</sup> Second, they model and estimate interest rate pass-through as the speed of adjustment in the short-run dynamics of error-correction models (ECM) with which loan interest rates converge to their long-run equilibrium values.

Findings common to the majority of these studies include that (i) banks with a high proportion of relationship lending tend to set lower pass-through; and (ii) banks with larger capital buffers or liquidity buffers tend to set lower pass-through. The first result can be interpreted as demonstrating the function of inter-temporal interest rate smoothing typically observed in relationship lending. This means that when future benefits are expected to flow from a bank-firm lending relationship, banks tend to smooth out transaction conditions from a longer-run perspective (providing a kind of insurance function) rather than setting loan interest rates to satisfy short-term payoffs. In this case, loan interest rates are largely unresponsive to variations in market interest rates and, as a result, interest rate pass-through declines. The second result is also basically understandable in the context of relationship lending: banks with larger capital buffers or liquidity buffers are able to provide borrowing firms with transaction conditions which deviate from short-run payoffs. Because banks operating in such circumstances smooth out transaction conditions from a longer-run perspective, interest rate pass-through falls.

Most of these existing studies use bank-side data to examine heterogeneity in interest rate pass-through among individual banks. However, pass-through also depends on the balance sheet characteristics of borrowing firms. For example, if borrowing firms raise a large amount of funds by issuing commercial paper or corporate bonds – which are alternatives to bank lending – banks' loan interest rate setting behavior might be affected by interest rate developments in these alternative markets. In addition, if borrowing firms' financial conditions temporarily deteriorate due to exogenous factors, banks might smooth out loan interest rates from a longer-run perspective if they expect to receive future benefits by maintaining their relationships with customer firms. As a result, interest rate pass-through declines.<sup>3</sup> These considerations suggest that a possible direction to extend existing interest rate pass-through estimation studies is to take account of borrowing firms' balance sheet characteristics.

In this study we estimate loan interest rate pass-through behavior among Japanese banks. The sample period selected for our study is the post-2003 period in order to avoid serious data discontinuity due to mergers and acquisitions in Japan's banking sec-

tor. Loan interest rates have followed a moderate declining trend during this period, although it also includes some upward movements such as those that occurred in 2005 and 2007 (Fig. 1).

To the best of our knowledge, no previous study has provided empirical analysis of loan interest rate pass-through in Japan using individual bank-level data. Although some existing studies investigate relationship lending characteristics (for example, Ono and Ue-sugi, 2009 and others) using Japanese micro data, no previous research has investigated the connection between relationship lending characteristics and interest rate pass-through. It is against this background that we present loan interest rate pass-through estimation results based on a bank-level dataset. However, our contributions are not limited to this point. More novel feature of our study is that it takes account of borrowing firms' balance sheet characteristics as a possible determinant of pass-through, a factor which has been neglected in previous studies. In this respect, Weth (2002), for example, points out the possibility that loan interest rate pass-through depends on borrowers' risk characteristics, although he remarks that the analysis of this possibility is beyond the scope of his study. In designing our empirical methodology, we refer to Gambacorta (2008), who estimates an ECM by applying the generalized method of moments (GMM) to a panel dataset.

This study also focuses on possible changes in loan interest rate pass-through after the recent global financial crisis. Few studies examine the determination of loan interest rates in the post-crisis period. One exception is the investigation of Gambacorta and Mistruilli (2014), who analyze this issue using a dataset drawn from individual Italian banks.<sup>4</sup> They report that (i) pass-through is lower for banks with a higher proportion of relationship lending than for other banks, even in the post-crisis period; and (ii) pass-through is lower for banks with larger capital buffers or liquidity buffers. These results suggest that the mechanism by which loan interest rate pass-through is determined has not changed significantly among Italian banks as a result of the global financial crisis.<sup>5</sup> However, it is still possible that Japanese banks have changed their pass-through setting behavior since the global financial crisis, as pressure to lower loan interest rates has strengthened due to extensive monetary easing and greater lending competition among banks. Meanwhile, Japan's banking system as a whole has maintained its resilience, even in the post-crisis period, and public measures designed to increase bank lending, such as financing facilities for small and medium-sized companies, have been broadly introduced.<sup>6</sup>

The remainder of this paper is organized as follows. Section 2 explains the method employed for estimating loan interest rate pass-through and describes the dataset we use. Section 3 reports the empirical Japanese bank pass-through results. We present the estimation results derived using both full-sample data since the early 2000s and post-crisis data. As a robustness check, we further investigate the existence of asymmetry of pass-through between rising and falling interest rate phases. Section 4 concludes the paper.

<sup>1</sup> Some previous studies estimate loan interest rate pass-through using country-level aggregate data rather than individual bank data. For example, Sørensen and Werner (2006) use a dataset from euro area countries, and Giginishvili (2011) use a dataset comprising observations from 81 countries.

<sup>2</sup> Relationship lending is lending conducted under the lender-borrower relationship (relationship banking). Although there is no single definition of relationship banking, Boot (2000) defines it as “the provision of financial services by a financial intermediary that (1) invests in obtaining customer-specific information, that is often proprietary in nature; and that (2) evaluates the profitability of these investments through multiple interactions with the same customer over time and across products.” Ongena and Smith (2000) define it as “connection between a bank and customer that goes beyond the execution of simple, anonymous, financial transactions.” For surveys of theoretical and empirical studies on relationship lending, see Degryse et al. (2009) and Ono (2011).

<sup>3</sup> Using a dataset of individual banks' interest rates in the U.S. loan market, Berlin and Mester (1998) present empirical results showing that banks smooth out loan interest rates against an exogenous shock to credit risk for small and medium-sized companies.

<sup>4</sup> Although they use individual bank data, their empirical methodology differs from ours and that of Gambacorta (2008) in that it uses cross-section data rather than panel data.

<sup>5</sup> Illes et al. (2015) and Paries et al. (2014) examine possible changes in loan interest rate pass-through after the global financial crisis. They report that pass-through estimated at aggregate levels is largely unchanged.

<sup>6</sup> European countries also introduced measures to support financial system stability after the financial crisis. However, most of them were aimed directly at strengthening banks' capital basis rather than at increasing bank lending. In practice, European banks continued deleveraging after the crisis, while NPL problems have become serious.

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