



# The bank-lending channel empirically revisited<sup>☆</sup>

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## ABSTRACT

This study examines the role of bank equity and bank lending in the monetary transmission mechanism in Norway from January 1993 to August 2008. We apply linear and nonlinear vector-auto-regressive models (VARs) estimated using aggregate monthly data. The results provide support for a “risk-taking channel” in the form of a recasted bank-lending channel running through market-based wholesale funding, in which the impact of monetary policy depends on banks’ financial strength. When banks are weakly capitalized, results based on a nonlinear VAR show a larger monetary-policy effect on real activity.

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## 1. Introduction

In the wake of the Great Recession, the literature has been enriched by numerous contributions that expand our understanding of the complex interplay between the financial sector and the real economy. Yet, it has also been argued that prevailing macroeconomic paradigms and models are not well suited to capture what [Borio and Zhu \(2012\)](#) label the “risk-taking channel of monetary policy”, namely the link between monetary policy and the perception and pricing of risk by economic agents. Providing an important theoretical contribution, [Disyatat \(2011\)](#) seeks to model this channel in the form of a substantial reformulation of the traditional bank-lending channel. The focal point of the present analysis is to examine the empirical validity of the underlying mechanisms that may cause such a channel in the monetary transmission mechanism.

Although the importance of a bank-lending channel is still an open issue, various empirical studies have explored its impact.

Analyses based on aggregate data have typically examined the effect of monetary policy on a ratio of bank credit to the sum of bank and non-bank credit. The response of such a variable to monetary-policy shocks has indicated that a bank-lending channel is operative (e.g., [Halvorsen and Jacobsen, 2014](#); [Iacoviello and Minetti, 2008](#); [Kashyap et al., 1993](#); [Ludvigson, 1998](#)).<sup>1</sup>

However, the bulk of the empirical bank-lending channel research has utilized cross-section information about banks, in particular differences concerning their balance-sheet items. This literature finds that banks’ lending responses to changes in monetary policy can depend on their size, liquidity and capital ratios (e.g., [Altunbas et al., 2002](#); [Ehrmann et al., 2001](#); [Gambacorta and Mistrulli, 2004](#); [Gambacorta, 2005](#); [Kashyap and Stein, 1995, 2000](#); [Kishan and Opiela, 2000, 2006](#); [Van den Heuvel, 2002](#)). Overall, the results suggest that banks cut back more on their lending in response to a contractionary monetary-policy shock when they are (either) smaller, less capitalized and/or more illiquid. More liquid banks can better insulate their loan portfolios by instead drawing

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<sup>1</sup> The result is consistent with the conventional bank-lending channel in which banks react differently to monetary-policy shocks compared to non-depository lenders. However, the finding is not inconsistent with the recasted bank-lending channel if banks are special intermediaries with different lending behavior compared to non-depository lenders.

down liquid securities. Moreover, if informational asymmetries and agency problems are attributed more to smaller, undercapitalized and less liquid banks, then such intermediaries can have less access to wholesale funding. Hence, their lending is more responsive to retail-deposit variations following monetary-policy changes. The empirical findings are therefore, by and large, interpreted as supportive of the conventional bank-lending channel. Still, from the perspective of the recasted bank-lending channel, stronger balance sheets and attenuated agency problems yield a smaller external finance premium and hence lending becomes less sensitive to monetary-policy changes. The findings therefore also allow for an interpretation where the causal mechanism runs through market-based wholesale funding.

This paper contributes to the literature by examining the validity of the reformulated bank-lending channel, but also sheds light on the traditional channel and, moreover, the bank capital channel as described by Van den Heuvel (2006). The theoretical model by Disyatat (2011) predicts an inherent nonlinear linkage between banks' equity ratio and their funding costs, in which the strength of variables' reaction to a monetary-policy shock can vary depending on the equity ratio. The model by Van den Heuvel (2006) also implies that the size and dynamics of effects are dependent on the initial level of banks' equity. Consequently, the applied empirical method must account for the possibility that responses to shocks depend on the banks' overall equity ratio and the sign and size of shocks. We therefore estimate multi-regime vector-auto-regressive models (MRVARs) in which the equity ratio of the banking sector is the threshold variable, allowing banks' financial strength to be a nonlinear propagator of shocks.

To the best of our knowledge, this is the first study that empirically investigates the reshaped bank-lending channel of Disyatat (2011), and also the first analysis that examines the bank-lending channel within a nonlinear empirical framework. Studies closest to this analysis are examinations of whether credit-market conditions play a role as nonlinear propagators of shocks using nonlinear VAR methodology (e.g., Atanasova, 2003; Balke, 2000; Calza and Sousa, 2006; Li and St-Amant, 2010; Mittnik and Semmler, 2014).

Our empirical results are neither consistent with the predictions of the conventional bank-lending channel nor the bank-capital channel of Van den Heuvel (2006), but are in accordance with the recasted bank-lending channel of Disyatat (2011). Naturally, the results do not refute the conventional bank-lending channel nor the bank-capital channel in the monetary transmission mechanism in general. However, the key message of the present analysis is that when examining Norwegian data from the first half of the 1990s until the financial crisis of the late 2000s and when applying a nonlinear empirical model – the findings are clearly supportive of a reformulated bank-lending channel operating through market-based wholesale funding, in which the amplification mechanism depends on banks equity ratio and has a fairly swift impact on bank lending and real activity.

The rest of the paper is organized as follows: in Section 2 we provide an overview of bank-lending channels and the role of bank capital in the transmission mechanism. Section 3 reviews the nonlinear empirical method. Results and robustness checks are described in Section 4. Section 5 provides concluding remarks.

## 2. Background to the study: an overview of the role of bank capital in the monetary transmission mechanism

The credit channel of monetary policy is generally considered to operate through two sub-channels: one works through the balance-sheet channel of non-bank-private-sector agents (e.g., Bernanke and Gertler, 1995) and the other through financial intermediaries. The credit sub-channel that operates through intermediaries is

commonly labeled a bank-lending channel, but the mechanisms behind this channel and the role of bank capital are disputed. Currently, at least three distinct theoretical approaches have been proposed to describe the working of such a channel:

- The traditional bank-lending channel with capital (see Bernanke and Blinder, 1988; Van den Heuvel, 2002)
- The bank-capital channel of monetary policy (see Van den Heuvel, 2006)
- A recasted bank-lending channel (see Disyatat, 2011)

These approaches differ substantially in their predictions concerning the impact from a monetary-policy shock on the liability structure of banks and their lending response under different capital ratios. This is more thoroughly accounted for below.

### 2.1. The traditional bank-lending channel

The traditional bank-lending channel, first portrayed by Bernanke and Blinder (1988), accounts for a direct link between monetary policy, bank reserves and total deposits, where the impact on depository funding results in altered bank lending. More specifically, expansionary monetary policy in the form of an open-market operation by the central bank will automatically increase the level of bank reserves. With reserve requirements, an increase in reserves implies that banks can increase their holding of deposits until the reserve requirements again are met. If wholesale funding (or equity finance) is a more expensive funding source than deposits, then an increase in bank reserves will decrease banks' funding costs beyond conventional effects. If increased funding demand is not fully offset by increased securities holdings, then banks' loan supply shifts outwards. Moreover, if non-bank credit is a costlier alternative than bank loans, then increased bank lending is expected to have positive effects on real activity.

As discussed by Van den Heuvel (2002), Bernanke et al. (1991) and Kashyap and Stein (1994), the conventional bank-lending channel will be less potent with low bank equity. If bank equity is close to the regulatory minimum for an ample fraction of banks, then an expansionary monetary-policy shock will have a smaller effect on bank lending since the supply of loans cannot be significantly expanded without additional equity, and the latter is presumed to be the most expensive funding source. The implication is that monetary-policy effects on lending will be strongest with well-capitalized banks and diminished when bank equity is low.

### 2.2. The bank-capital channel of monetary policy

The results from the traditional bank-lending channel are derived from a static model. Conversely, the bank-capital channel presented in Van den Heuvel (2006) relies on a dynamic model of bank asset-liability management. Moreover, the bank-capital channel model does not differentiate between different types of bank liabilities (deposit and wholesale funding can be viewed as perfect substitutes). Three basic assumptions underpin this model. The first two are risk-based capital requirements (cf. the Basel Accord) and an imperfect market for equity, which implies a failure of the Modigliani–Miller theorem. The third assumption is that banks are materially exposed to interest-rate risk.

The exposure to interest-rate risk implies a direct link between monetary policy and bank profits (and therefore bank equity), and yields the bank capital channel of Van den Heuvel (2006), i.e., the mechanism that amplifies the standard interest-rate channel of monetary policy. With an expansionary monetary-policy shock, profitability improves. The amplification mechanism is initially weak in Van den Heuvel's model, but could be strong after

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