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Reexamining the empirical relation between loan risk and collateral: The roles of collateral liquidity and types☆

Allen N. Berger[a], W. Scott Frame[b], Vasso Ioannidou[c,*]

[a] *University of South Carolina, Wharton Financial Institutions Center, United States; European Banking Center, the Netherlands*
[b] *Federal Reserve Bank of Atlanta, United States*
[c] *Lancaster University & CEPR, U.K.*

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ABSTRACT

This paper offers a possible explanation for the conflicting results in the literature concerning the empirical relation between collateral and loan risk. We posit that differences in collateral characteristics, such as liquidity, may be associated with the empirical dominance of different risk-collateral relations implied by economic theory. Using credit registry data and a novel identification strategy to control for borrower and lender selection effects allows us to differentiate between the *ex ante* and *ex post* theories of collateral. We find that collateral overall is associated with lower risk premiums and higher default rates. The results indicate an important role for collateral in mitigating losses and reducing risk-taking incentives, consistent with *ex post* theories. Liquid collateral is associated with especially low risk premiums, and these loans perform better than those with illiquid collateral or no collateral. We also find that individual collateral types exhibit significant variation in terms of risk-collateral relations, with some consistent with *ex ante* theories and others with *ex post* theories. Our results suggest that the conflicting results in the

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* Corresponding author. Tel.: +441524592083.
E-mail addresses: aberger@moore.sc.edu (A.N. Berger), scott.frame@atl.frb.org (W.S. Frame), v.ioannidou@lancaster.ac.uk (V. Ioannidou).

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literature may occur because different samples may be dominated by different types of collateral with different economic characteristics.

1. Introduction

Collateral is a prominent feature of debt contracts, and significant declines in the value of widely pledged assets can amplify the business cycle through procyclical changes in credit availability, including during the recent financial crisis (e.g., Bernanke and Gertler, 1989, 1990; Kiyatoki and Moore, 1997; Gan, 2007; Boz and Mendoza, 2014; Gorton and Ordonez, 2014). As U.S. housing prices began falling in the latter half of the 2000s, mortgage defaults rose substantially and the value of mortgage-related collateral plummeted. As a result, households' ability to borrow against their homes and financial institutions' ability to pledge or sell mortgage-backed securities became impaired.

While these events suggest that secured credit may be associated with higher risk, economic theory suggests that collateral pledges may be associated with either higher or lower risk. The presence of collateral is generally explained as an attempt to reduce agency costs or contracting frictions in the presence of asymmetric information.[1] One strand of theory focuses on *ex ante* private information and suggests that collateral may allow lenders to sort observationally equivalent loan applicants through signaling.[2] Specifically, lenders offer a menu of contract terms such that observationally equivalent applicants with higher-quality projects choose secured debt with lower risk premiums, while those with lower-quality projects elect unsecured debt with higher risk premiums. A second set of theories motivates collateral as part of an optimal debt contract by invoking *ex post* frictions, like moral hazard, and predicts that observably riskier borrowers are more likely to be required by lenders to pledge collateral.[3]

To test these theories, a number of empirical studies link measures of loan risk – such as loan risk premiums (loan rates minus the risk-free rate) and *ex post* nonperformance (delinquency or default) – to whether or not collateral was pledged. The findings presented in these papers are mixed. Some studies report a positive relation between loan risk premiums and collateral (e.g., Berger and Udell, 1990; Blackwell and Winters, 1997; Machauer and Weber, 1998; John et al., 2003; Brick and Palia, 2007; Godlewski and Weill, 2011), while others find a negative relation (e.g., Degryse and Van Cayseele, 2000; Lehmann and Neuberger, 2001; Agarwal and Hauswald, 2010; Berger et al., 2011; Cerqueiro et al., forthcoming).[4] One study finds no significant relation between collateral and loan risk premiums for loans drawn under commitment (Berger and Udell, 1995). In addition, two studies find that *ex post* nonperformance of loans is positively related to collateral (Jimenez and Saurina, 2004; Berger et al., 2011).

To our knowledge, there are no attempts to explain this puzzle in the literature – why the empirical relation between measures of loan risk and collateral is sometimes positive and at other times negative. This paper provides a potential solution by examining the empirical relation between loan risk and the economic characteristics and types of collateral. The implication is that the prior literature may have

[1] Some theories of collateral do not emphasize the roles of asymmetric information. For example, Inderst and Mueller (2007) show that collateral may be required by local relationship lenders facing competition from distant transactional lenders to boost profitability when lending to risky borrowers. In addition, Manove et al. (2001) emphasize the role of collateral as a substitute for bank screening of borrowers.

[2] For examples of these theoretical models, see Bester (1985, 1987), Besanko and Thakor (1987a, 1987b), Chan and Thakor (1987), and Boot et al. (1991).

[3] See Boot et al. (1991), Boot and Thakor (1994), Aghion and Bolton (1997), and Holmstrom and Tirole (1997) for examples of models with moral hazard. Other *ex post* frictions modeled in the literature include difficulties in enforcing contracts (e.g., Banerjee and Newman, 1993; Albuquerque and Hopenhayn, 2004; Cooley et al., 2004) and costly state verification (e.g., Townsend, 1979; Gale and Hellwig, 1985; Williamson, 1986; Boyd and Smith, 1994).

[4] Agarwal and Hauswald (2010) report a negative relation between commercial loan rates and the incidence of collateral. The result is presumably consistent with a negative relation between loan rate premiums and collateral, given that risk-free rates changed only modestly during their 15-month sample period. Using a differences-in-differences approach, Cerqueiro, Ongena, and Roszbach (forthcoming) find that following the change in the law and the loss in collateral value borrowers pay a higher interest rate on their loans, receive a worse quality assessment by their bank, and experience a substantial reduction in the supply of credit by their bank.