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Differentiated use of small business credit scoring by relationship lenders and transactional lenders: Evidence from firm–bank matched data in Japan

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ABSTRACT

This paper examines the ex-post performance of small and medium enterprises (SMEs) that obtained small business credit scoring (SBCS) loans, using a unique Japanese firm–bank matched dataset. The ex-post probability of default after the SBCS loan was provided significantly increased for SMEs that obtained an SBCS loan from a transactional lender. Also, the lending attitude of relationship lenders during the recent global financial crisis was more severe if a firm had received an SBCS loan from a transactional lender. These findings suggest that SBCS loans by transactional lenders are more prone to type II errors and detrimental to relationship lenders' incentive to provide "liquidity insurance."

1. Introduction

Loans to small businesses have traditionally been based on intimate relationships between borrower firms and lenders, because many of these firms are much more informationally opaque than large firms and thus lenders primarily rely on "soft" information gathered through long-lasting transaction relationships. However, advances in information technology over the past decades have considerably transformed the landscape of small business lending, and a number of transaction-based lending technologies that rely on quantifiable and verifiable "hard" information have become available. In particular, small business credit scoring (SBCS) has expanded rapidly in many countries and has attracted a fair amount of research interest.[1] It has been argued that SBCS is effective in increasing the availability of credit to small businesses (Agarwal and Hauswald, 2008; Berger et al., 2011, 2005a; Frame et al., 2001). However, the recent global financial crisis has raised concerns that, in cases where relationship lending plays an important role, SBCS loans may have adverse effects on the provision of credit by relationship lenders during times of crisis.[2]

Against this background, the present paper, focusing on Japan, examines how firms that received SBCS loans weathered the financial crisis that erupted after the failure of Lehman Brothers in September 2008. In particular, the paper examines whether the ex-post performance of firms that received an SBCS loan before the crisis depends on whether the lender was a relationship or transactional lender. Most, if not all, previous studies assume that SBCS loans are provided by transactional lenders. However, as we show below, SBCS loans may be provided by relationship lenders as well. We argue that the differentiated use of SBCS by relationship and transactional lenders may affect firms' ex-post performance as well as the relationship lenders' willingness to provide rescue finance when firms face difficulties during crisis.

The analysis in this paper relies on a unique firm–bank matched dataset on SBCS in Japan. Our dataset is based mainly on firm

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[1] See Berger and Frame (2007) for a survey.

[2] See "When Business Credit Scores Get Murky," *Wall Street Journal*, March 18, 2010.

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surveys conducted during 2008–2009. The virtue of these surveys is that we can identify SBCS loan user firms and non-user firms as well as firms' primary bank, that is, the bank that has the largest amount of loans outstanding to a particular firm. Moreover, we can identify whether a primary bank (which we assume to be a relationship lender) or a non-primary bank (transactional lender) has extended SBCS loans to a particular firm. Using this rich dataset, we can make inferences on the differentiated use of SBCS by relationship and transactional lenders.

Focusing on the period of financial turmoil after the failure of Lehman Brothers, we conduct two empirical analyses. The first examines the link between SBCS loans and firms' performance during the crisis. Whether the models underlying SBCS loans correctly identify firms with a higher probability of default (PD) and such loans therefore are superior to relationship loans is of both academic and practical interest, but the evidence to date is rather mixed (see, e.g., Agarwal and Hauswald (2008) and DeYoung et al. (2008) versus Berger et al. (2011)). We conjecture that this mixed evidence potentially stems from the fact that both relationship (primary) and transactional (non-primary) lenders use SBCS, but do so in different ways and/or for different purposes. Consistent with this conjecture, we find that, on average, the ex-post PD of firms that obtained SBCS loans from non-primary banks is higher than that of non-SBCS loan user firms, while the ex-post PD of firms that obtained an SBCS loan from their primary bank is smaller than that of non-SBCS loan user firms.

Second, we investigate whether the use of transactional loans such as SBCS loans adversely affected a relationship lender's incentive to provide assistance to its client-firms during the financial crisis. Theoretical studies on relationship lending suggest that relationship lenders will be willing to lend to profitable client firms during a crisis because they have gathered sufficient information on them (Rajan, 1992; Bolton et al., 2013). However, if a client firm has obtained an SBCS loan from a transactional lender, this may be detrimental to the relationship lender's willingness to provide a loan, because a higher indebtedness of a borrowing firm exacerbates its moral hazard incentives (Degryse et al., 2012). In addition, relationship lenders might infer that their client firms' creditworthiness had worsened if these firms had obtained an SBCS loans from transactional lenders, which may be more prone to type II errors (approving a loan that will default) than relationship lenders.[3] On the other hand, no such negative spillover effects should occur if SBCS loan have been extended by relationship lenders themselves. Consistent with the first part of this hypothesis, we find that the lending attitude of firms' primary bank worsened during the financial crisis if the firms had obtained an SBCS loan from a non-primary bank. In contrast, when SBCS loans were provided by the primary bank itself, we do not find such detrimental effects of SBCS loans on primary banks' lending attitude.

The study contributes to the literature on SBCS in the following respects. First, as highlighted by, for example, Mester (1997), the accuracy of SBCS models should be assessed based on their performance during an economic downturn. Yet, most studies on SBCS employ datasets for non-crisis periods. Focusing on the recent financial crisis, our study, as far as we are aware, therefore is the first to examine the performance of SBCS loans during a crisis. It also should be noted that most previous studies examine SBCS loans in the United States and there are few studies on other countries. Moreover, our study in fact is the first on Japan. Banking systems differ across countries, and examining the experience of Japan, with its idiosyncrasies, can help to provide a richer understanding of issues surrounding SBCS loans.

Second, most previous studies assume that the provider of SBCS loans is a transactional lender. However, our analysis shows that both relationship and transactional lenders extend SBCS loans, and these loans result in different outcomes. Specifically, we find that firms that obtained SBCS loans from transactional lenders were more likely to default than firms that obtained such loans from relationship lenders. Understanding why SBCS loans are associated with differences in firm performance depending on the type of lender is important. However, to date, this issue has received little attention in the literature, mainly due to data limitations: previous studies have had to rely on bank-level datasets that did not make it possible to distinguish whether banks extending SBCS loans were a relationship lender for particular firms.[4] In contrast, our firm–bank matched dataset allows us to make such a distinction.

Third, this paper empirically examines, to our knowledge for the first time, how the role of relationship lenders as providers of liquidity insurance during a financial crisis is affected by their clients' use of SBCS loans and finds that SBCS loans by transactional lenders have negative externalities. That is, while previous studies (e.g., Bolton et al., 2013) show that relationship lenders play the important role of providing favorable continuation-lending in a crisis, our findings highlight that SBCS loans by transactional lenders may have an adverse impact on the provision of liquidity by relationship lenders in times of crisis.

The remainder of the paper is organized as follows. Section 2 briefly describes the development of the SBCS loan market in Japan. Section 3 then develops our empirical hypotheses on how the use of SBCS loans affects the ex-post performance of borrower firms and the lending attitude of their relationship lenders during times of crisis. Section 4 describes the data and variables used and explains our empirical models. Section 5 presents and discusses the results of our empirical analysis. Section 6 concludes.

2. The development of small business credit scoring in Japan

Credit scoring is a quantitative method to evaluate the credit risk (PD) of loan applications. Using both qualitative and quantitative data and statistical techniques, credit scoring produces a "score" for a loan applicant that forms the basis of credit decisions such as whether or not to provide a loan and the loan contract terms. Following Berger and Udell (2006), we define SBCS loans as loans where the primary lending decision is based on numerical credit scores. Note that this definition does not rule out the use of other information (for instance, soft information that is primarily used in relationship lending) as a secondary source.

In the United States, credit scoring has been used for underwriting consumer credit for some time, but was not used for small business credit until the mid-1990s because of the heterogeneity of small businesses. The development of credit scoring models for small business loans in the 1990s was motivated by the casual observation that repayments of small business loans depended less on the business itself than on the credit history of the business owner (Mester, 1997). Since then, many U.S. banks have been using the consumer credit score of small business owners to evaluate small business loan applications.

SBCS has been rising in popularity among Japanese banks as well since the early 2000s. At the end of 2005, the outstanding amount of SBCS loans for the three largest banks was 5 trillion yen (about 50 billion dollars), about 5 percent of their entire loans outstanding to small businesses.[5] SBCS has also spread among

[3] See Section 3.2 for details.

[4] Most studies are based on a survey of the largest U.S. banks conducted by the Federal Reserve Bank of Atlanta in January 1998. A notable exception is the recent study by Berger et al. (2011) using a survey of U.S. community banks conducted by the U.S. Small Business Administration.

[5] *Nikkei Newspaper*, September 20, 2006.