SME Access to Intermediated Credit: What Do We Know, and What Don’t We Know?

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I. Introduction

Over the past several decades there has been a growing interest in SME financing among academics. In great part, scholarly interest in SME finance was a natural outgrowth of the early information-based theories of the banking firm (Diamond 1984, Ramakrishnan and Thakor 1984, Boyd and Prescott 1986). This “modern theory of the banking firm” argues that banks are uniquely suited to produce information about opaque borrowers. Follow-up theoretical and empirical work made a distinction between transparent firms that issue publicly traded arms-length debt and opaque firms that borrow in private intermediated markets (e.g., Diamond 1991, 1993, Rajan 1992, and Houston and James 1996). This helped fuel academic interest in SME finance by implicitly noting that the best place to look for how asymmetric information affects financial contracting is likely to be in the SME sector because SMEs are less transparent because of their small size.

More fundamentally, there is a natural link between the academic literature on banking and the academic literature on corporate finance with regard to SME financing because they are essentially two sides of the same coin. The literature on corporate finance (e.g., Jensen and Meckling 1976, Townsend 1979, Myers 1984, Myers and Majluf 1984) focuses on how firms access external finance. This covers a variety of topics including importantly internal finance versus external finance. In the SME sector external finance, more often than not, means, bank loans. To be more precise bank loans are the most important source of external finance for SMEs virtually everywhere in the world – developing as well as developed economies (e.g., for the U.S., Berger and Udell 1998). (There are, nevertheless, other important sources of external finance, the most important of which is trade credit (e.g., Berger and Udell 1998).) In some sense the academic literature on corporate finance focuses on the nature of SME external finance from the firm’s perspective, while the banking literature focuses on SME external finance from the lender’s perspective. At times, for sure, these literatures seem almost separable partially due to the fact they often seem to have evolved in separate “worlds”. But in the SME space, they are quite clearly two sides of the same coin.

Academic interest in SME finance has also been fueled by a heightened policy interest in the topic. Policymakers are naturally concerned about SMEs because they comprise such a large component of the global economy. Even in countries such as the U.S., which is viewed as a decidedly markets-oriented economy, the SME sector is nevertheless huge. About half of the labor force in the U.S. is employed by firms with less than 500 employees (Stangler and Litan 2009). However,
policymaker’s interest in SME access to finance has been driven by more than just the size of the SME sector. It has also been driven by other factors such as: the vulnerability of the SME sector due SME opacity; the potential impact of significant regulatory changes on SME access to finance (e.g., the potential impact of risk-based capital); significant structural changes in the bankin industry (e.g., consolidation and deregulation); and, the impact of macro shocks.

But, why another overview paper on SME finance? I, among others, have written a number of overview papers on SME finance – both on the broad topic of SME finance (e.g., Berger and Udell 1998) and on special issues within the general topic of SME finance (e.g., Berger and Udell 2002, Taketa and Udell 2007, Berger and Udell 2007, and Udell 2009, 2011). In my view, there are several reasons for taking stock again of where we are in terms of research on SME finance. More precisely, there are many reasons why this is a particular good time to write another general overview paper on SME finance. Probably first and foremost among these reasons is the heightened public policy interest in the topic mentioned in the previous paragraph. Probably more so than ever, policymakers are turning to the academic community for answers to questions about SME finance. Second, the current global financial crisis – arguably the biggest macro shock in nearly a century (i.e., the financial crisis in the U.S. and Europe) – has fueled enormous interest in SME finance that has generated a big uptick in research on the topic. Third, the cumulative body of literature on SME research has reached a point where we can start drawing much stronger conclusions about what we know about SME finance across firms and across countries. One striking example of the “seasoned” nature of this research is the new meta-analysis by Kysucky and Norden (2014) on relationship lending. Kysucky and Norden analyzed 101 separate studies of relationship lending in their paper.

Another factor driving the recent surge in research is the availability of new data sets that allow empirical investigation of theoretical models on SME access to finance. These include new country level data sets such as firm level survey data in Japan collected by the Research Institute of Economy, Trade, and Industry (e.g., Uchida, Udell and Yamori 2012) and loan level data collected by the Central Bank of Ireland as part of the Financial Measures Programme 2011 (e.g., McCann and McIndoe-Calder 2012). It also includes new cross country firm level survey data such as the World Bank and the European Bank for Reconstruction and Development’s Business Environment and Enterprise Performance Survey (e.g., Popov and Udell 2012) and ECB and European Commission’s firm level SAFE survey (e.g., Ferrando and Mulier 2013). As a result of these factors academic work on SME access to finance has significantly moved the needle since the last comprehensive assessment of SME access to finance in 1998, i.e., Berger and Udell (1998).
Specifically, the purpose of this paper is to conduct an assessment of what we know from the academic literature at this point in time about SME access to finance. Clearly in an overview piece such as this it will be impossible to discuss in detail all of the papers on this topic. My goal is to enumerate the key issues within the broad topic of SME access to finance and identify where the frontier of knowledge lies on each of these topics. As the title of this article suggests this translates into an investigation of what we know, and what we don’t know about SME finance. To manage this investigation I will use the prism of two paradigms that I helped to develop in earlier papers: the concept of lending technologies and the concept of SME lending channels. These will facilitate a discussion of what the extant literature tells about SME access to finance and to identify the biggest “holes” in the literature, i.e., the biggest research opportunities. Unlike Berger and Udell (1998), the last comprehensive analysis that I co-wrote, I will in the interest of time consider only on the debt side of SME finance.¹

In the next section of the paper I will present the concept of lending technologies and utilize it as a vehicle to discuss the current literature on many of the topics that comprise the body of literature on SME debt finance. In Section III I will present the concept of SME lending channels and use it to discuss several of the remaining topics that fall under the rubric of SME finance, specifically organizational issues associated with providing SME loans and how SME finance can be affected by macro shocks including prominently the relatively recent banking crisis in Japan and the current financial crisis in the U.S. and Europe. As part of the discussion in Sections II and III I will tweak and update prior papers that developed the related concepts of lending technologies and SME lending channels. Also, Sections II and III will mostly focus on “what we know” although there will be some discussion in these sections of “holes” in the literature. However, most of the discussion of “what we don’t know” will be deferred until Section IV. Everyone seems to like a “top ten list”. In that spirit, Section IV offers a top ten list of the biggest gaps in the SME finance literature. As I mentioned above, these can be viewed as my take on the top ten best research opportunities in this area. In Section V concludes.

II. **Lending Technologies and the Literature on SME Finance**

II.A. **Lending Technologies and SME External Finance**

¹ Berger and Udell (1998) covers the private equity markets as well as the private debt markets that provide external financing to SMEs. The private equity markets prominently include angel finance, formal venture capital finance and equity crowd funding. Because this paper only covers the private debt market, it does not cover some of the interesting new literature on developments in these private equity markets.
The concept of “lending technologies” was first introduced to the academic literature in Berger and Udell (2002). Its introduction was motivated in part to more closely connect scholarly work on SME finance to commercial lending as practiced by the institutions that provide business loans in the “real world”. Early academic research on banking and commercial lending was generally quite abstract. Distinctions were made between “arms-length” finance and “informed lenders” (i.e., corporate bonds vs. commercial loans) in the theoretical literature (e.g., Rajan 1992), and “bank uniqueness” as a delegated monitor in the empirical literature (James 1987). But granular examination of how banks actually underwrote commercial loans can best be traced to the early papers on relationship lending (e.g., Petersen and Rajan 1994, 1995; Berger and Udell 1995). At the risk of some oversimplification the academic literature became so focused on “relationship lending” that to some extent the dichotomy between “arms-length” bond investors and informed bank lenders became redefined to mean that the world of debt was divided into just two parts: bond investors and relationship lenders. This came with the implication in much of the academic literature that the only way in which banks extended credit – particularly in the SME market – was through relationship lending.

The principal contribution of Berger and Udell (2002) was to highlight the reality that both large and small banks lend to SMEs in many ways that deviate from a singular emphasis on soft information production that lies at the core of relationship lending. Berger and Udell (2002) and subsequent refinements (e.g., Berger and Udell 2006, Berger 2015) emphasized that banks lend to SMEs using a variety of different “lending technologies”. These lending technologies are not necessarily available in all countries depending on a country’s financial institutions structure and its lending infrastructure (Berger and Udell 2006). Big distinctions likely exist between developed vs. developing economies and even among developed economies. In this section we will discuss the (hopefully) exhaustive list of lending technologies recognizing that some of these are not practiced in many countries. The “exhaustive” list below likely describes the landscape in countries like Australia, the U.K. and the U.S. at this point in time. (It is a somewhat updated list from recent papers on lending technologies.)

Our discussion of these lending technologies serves two purposes. First, it provides a conceptual framework for thinking about SME finance on many dimensions. Second, it provides a convenient conduit for discussing the frontier of much of the academic literature on SME finance. That is, we will highlight in Section II.B the literature on each separate lending technology and in Section III.C we will discuss the growing literature on the lending technology paradigm itself.

Before listing the lending technologies we need to define precisely what is meant by a lending technology. A lending technology can be viewed as a “unique combination of the primary source of
information, screening and underwriting policies/procedures, structure of the loan contracts, and monitoring strategies and mechanisms” (Berger and Udell 2006). Figure 1 lists the 10 lending technologies that exist today in at least some countries. Column 2 lists whether the lending technology is “relationship-based” or “transactions-based”. Column 3 notes whether the technology is primarily designed for relatively opaque SMEs, relatively transparent SMEs, or both. Finally, column 4 maps column 2 but emphasizes the primary source information on which the technology, i.e., whether it is “soft” information or “hard” information. Hard information can be viewed as information that is not quantifiable and not easily transmitted within the hierarchy of the financial institution using the lending technology (Stein 2002). One interesting aspect of Figure 1 is that columns 3 and 4 do not necessarily line up in ways implied by the early literature on banking and lending. As we noted above the early literature (in part) implied that banks collect soft information in order to underwrite loans to opaque SMEs and collect hard information to lend to transparent SMEs – but not vice versa. Figure 1 emphasizes that many hard (and transactions-based) lending technologies are used to lend to relatively opaque SMEs. One caveat about these lending technologies: they are not necessarily mutually exclusive – even at the loan level. That is some aspects of one lending technology may be deployed as a secondary underwriting tool in conjunction with the primary lending technology. In other words, a lending technology relates to how a loan is primarily underwritten and monitored.

Now let’s briefly define each lending technology. (A more extensive definition and discussion of most of these lending technologies can be found in Berger and Udell (2006) and Berger (2015).)

**Relationship Lending.** In relationship lending lenders collect soft information over time and contact venues about the borrower and the entrepreneur and use this information in underwriting the loan and monitoring the borrower over time. Relationship lending is often the lending technology of choice when other lending technologies are not available (e.g., when audited statements and collateral are unavailable and trade credit access has been exhausted).

**Financial Statement Lending.** In financial statement lending a lender’s underwriting and monitoring decisions are based on the firm’s financial statements. A necessary condition for financial statement lending is the availability of an informative set of the financial statements. For the most part this implies audited financial statements where the accountant verifies the existence and value of the firm’s assets, liabilities and cash flows. Lenders can then make underwriting and monitoring decisions primarily based on ratios calculated from these audited financial statements. A second necessary condition is that these ratios are relatively strong.

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Berger (2015) makes a distinction between “judgment lending” and “relationship lending”. Both are based on soft information lending. Judgment lending refers to soft information lending early in (including the beginning of) a banking relationship before much soft has been accumulated over time and over multiple banking products. In this paper the two are collapsed into a single lending technology recognizing that early in a relationship the accumulation of soft information is less than later in a relationship.
When these ratio are weak (i.e., when they signal high risk), SMEs are likely to obtain external finance through one of the other transactions based (hard) lending technologies.

Asset-based Finance. Asset-based finance – also known as discounting in some countries – is a lending technology designed for SMEs whose financial statements (either audited or unaudited) reflect a weak borrower (typically highly leveraged), and a borrower that has accounts receivables and inventory that are pledged as collateral. This lending technology is typically used for working capital purposes and is associated with loan-to-value (LTV) ratios on accounts receivable and inventory that are calculated on a daily basis. The LTV ratio that is set against the accounts receivable and the inventory respectively using quantitative formulas that relate to the quality and nature of the accounts receivable and the inventory. Another distinguishing feature of asset-based lending is periodic external audits (typically quarterly) of the borrowing firm and the firm’s collateral conducted by the lender known as “field exams”. Asset-based lending is frequently extended in conjunction with another lending technology, equipment lending. (See Udell 2004.)

Factoring. In factoring the lender – known as a factor – purchases accounts receivable from the “borrower”. The amount advanced (the analogue of the LTV ratio) to the borrower against specific accounts receivable (i.e., invoices) is typically calculated using the same basic quantitative metrics as in asset-based lending. Unlike asset-based lending the ownership of the accounts receivable passes from the “borrower” to the factor. (See Udell 2004.)

Equipment lending. Equipment lending is lending secured by equipment. If the purpose of the loan is to purchase the equipment the LTV ratio is applied to the purchase price of the equipment and (typically) the amortization is based on the life-span of the equipment. If the purpose of the loan is other than to purchase the equipment itself, the LTV ratio is applied to the appraised value of the equipment and the amortization is set based on the remaining lifespan of the equipment. For many loans, particularly in developed economies, professional appraisers are hired to evaluate the equipment. (See Udell 2004.)

Leasing. Leasing is similar to equipment lending except that the “lender” (the lessor) owns the equipment rather than the “borrower” (the lessee).

Real estate-based lending. This involves lending to an SME using real estate as collateral. This can involve lending funds to an SME to buy real estate (e.g., a building) or it can involve lending for other purposes but underwriting the loan primarily based on the value of the real estate. The real estate can either be commercial property owned by the firm or owned separately by the entrepreneur. It can also be residential property owned by the entrepreneur. Real estate lending is typically based on an independent appraisal of the real estate.

Small business credit scoring. This is a relatively new lending technology in which the loan is primarily (or exclusively) based on a multivariate statistical model. This technology was first introduced by Wells Fargo Bank in 1995 and spread relatively quickly to other large banks in Europe and Japan. Now it is often underwritten exclusively through an internet platform with

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3 Many large appraisers also provide collateral liquidation services. There may be a valuable synergy in combining these two activities. That is, the data these companies collect in their liquidation business may provide valuable pricing information that is useful in their appraisal business. (See Udell 2004.)
minimal or no human interaction. Banks use this technology for smaller loans typically under $250,000, or in many cases under $100,000.

Crowd funding. Often referred to as peer-to-peer (P2P) lending, this technology involves borrowing from other individuals through a P2P platform. The amounts are typically quite small and usually the loan is made directly to the entrepreneur on an unsecured basis.

Trade credit. This is credit extended by vendors to purchase raw materials. It appears as an accounts payable on the borrower’s balance sheet and as an accounts receivable on the lender’s balance sheet. The terms of credit often specify a maximum maturity and a shorter discount period during which the borrower can pay off the obligation at a discounted price. The “price” of trade credit may be jointly determined with the price of the underlying goods.

Before turning to a discussion of the academic literature related to the individual lending technologies several additional aspects of SME loan underwriting are worth mentioning. First, the purpose of an SME loan typically falls into one of three categories: working capital financing, fixed asset financing, and acquisition financing. Some of these lending technologies are typically associated with specific purposes. Others are not. Asset-based lending, factoring and trade credit financing are typically associated with working capital financing, i.e., they are used to finance accounts receivable and/or inventory. All three of these lending technologies are often associated with lines of credit which allow funding levels to vary according to the ebb and flow of current assets. Leasing is typically associated with fixed asset financing. However, all of the other lending technologies could be used for working capital purpose or fixed asset purchase. For example, lending against existing equipment can provide funds for working capital purposes. Many of these lending technologies could be used in conjunction with acquisition loans (i.e., loans used for the purpose of buying another company), for example, asset-based loans.

Second, different lending technologies can be used for different loans to the same company. For example, it is quite common for financial statement lending to be combined with equipment lending. A bank might extend a line of credit for working capital purposes to a firm based on financial statement lending and extend an equipment loan for the purpose of purchasing a piece of equipment. Further, equipment may be pledged as secondary source of repayment in a working facility secured by accounts receivable and inventory.

Third, often there is not bright line between these lending technologies at the loan level. For example, there may be a relationship aspect to a financial statement loan. Banks, for example, often

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4 In a sale leaseback, leasing could be associated with something other than the financing of the fixed asset being leased because the proceeds from sale leaseback are fungible.
give some weight to the strength of the banking relationship (i.e., incorporate some soft information) in underwriting a financial statement loan. We would nevertheless classify this loan as a financial statement loan if this was the primary technology used in underwriting and monitoring the loan (even though some weight was given to the strength of the bank-borrower relationship).

Fourth, beyond the lending technologies themselves we can consider some “credit multipliers”. Two credit multipliers have received considerable policy attention recently. First, many countries offer government guarantee programs where government guarantees partially indemnify loans made in the private sector. Second, in many developed economies some SME loans have been securitized. These credit multipliers have been introduced based on the assumption of the existence of temporary or permanent funding gap in the SME sector. We will return to the subject of credit multipliers in Section IV.

II.B. **Lending Technologies and Related Academic Literature**

In discussing the literature on SME lending through the prism of lending technologies it will be helpful to decompose the discussion into the literature on the individual lending technologies and the literature on the lending environment (i.e., infrastructure) that affects the existence and importance of each of the lending technologies across the globe.

Further, for expository purposes it will be helpful to break our discussion of the literature on individual lending technologies into two categories: non collateral-based technologies and collateral-based technologies. This may seem odd at first blush because it sort of implies that there is a powerful common link among the collateral-based lending technologies. That is, it implies that they have more in common than they actually do. It is true that all of the collateral-based lending technologies involve lending against the value of a tangible asset, but that is in great part where the similarity ends. Grouping the collateral-based lending technologies together is, instead, driven by the fact that academics have often grouped these together. Indeed, there is a sub-literature that can best be described as the literature on collateral. As I will argue below this implicit grouping of these collateral-based lending technologies has fostered some confusion and misconceptions about how similar they are. I will elaborate on this confusion and highlight why these collateral-based lending technologies can be viewed as quite distinct.

II.B.1. **The Literature on Individual Lending Technologies**

II.B.1.a. **Non Collateral-based Lending Technologies**
**Relationship Lending.** It is probably safe to assert that more has been written about relationship lending than all of the other lending technologies combined. At first blush this suggests that we should devote proportionately more space in this paper to relationship lending because there is so much written about it. But, as it turns out, it is the only lending technology on which we have the advantage of a meta-analysis – the cross country meta-analysis on relationship lending by Kysucky and Norden (2014), (KN). By exploiting this analyzes of 101 separate studies we can cover relationship lending most efficiently by simply summarizing the key findings in this study. Of course, the large literature on relationship lending makes such a study feasible. But, the large and growing literature on several other of the lending technologies (e.g., trade credit) or groupings of technologies (e.g., collateral) suggests the possibility that the time might be right for more meta-analyses on SME lending. I will also offer few additional comments on relationship lending.

As noted above, in deploying this technology lenders collect soft information over time about the borrower and the entrepreneur and use this information in underwriting the loan and in monitoring the borrower over time. Probably the most critical issue is whether relationship lending indeed reduces information asymmetries through the production of soft information. In other words, does it work? And, does it produce benefits to the borrower? By definition soft information is not quantifiable and easily transmitted within the hierarchy of lending organization. This makes it unobservable to the empiricist. Thus, from the beginning of the literature on relationship lending (e.g., Petersen and Rajan 1994, 1995, Berger and Udell 1995) researchers have sought proxies for the production of soft information most of which are related to the strength of the relationship. These proxies include relationship length, bank-borrower distance, exclusivity, and cross-product information synergies.5

The KN analysis indicates strong relationships tend to benefit SMEs in terms of lending outcomes. Importantly, however, KN notes that “lending outcomes differ across the relationship’s dimensions”:

“Long-lasting, exclusive and synergy-creating bank relationships are associated with higher credit volume and lower loan rates. These benefits are more likely in the US and in countries where bank competition is high. They are not related to the importance of SMEs in an economy, suggesting that prevalence of relationship lending does not necessarily come along with borrower benefits.”

5 In addition to the KN meta-analysis there have been several papers exclusively devoted to a review and assessment of the literature on relationship lending (Boot 2000, and Elyansiani and Goldberg 2004) and other papers that included a comprehensive discussion of this literature (e.g., Berger and Udell 1998, 2002 and 2006). For a comprehensive discussion of the literature see these papers in addition to KN.
Several aspects of relationship lending deserve a bit more discussion. The KN finding on competition is interesting because theoretical models of relationship lending suggest that that in order to induce a bank to invest in a relationship, the bank needs some market power to insure that its investment has a positive net present value (e.g., Petersen and Rajan 1995). This implies in turn a “hold-up problem” where relationship-dependent SMEs become captured by their relationship lenders. Thus, there is inherently a tension between the benefits of competition (more competition diminishes the hold-up problem and improves pricing to the SME) and benefits of market power (encouraging more relationship lending). The KN finding essentially implies that competition wins this horse race. One interesting caveat to this is the possibility, however, that this finding might be quite sensitive to how competition is measured, e.g., whether it is measured the Lerner index or by concentration measures such as the HHI (Carbo-Valverde, Rodriguez-Fernandez and Udell 2009).

The existence of a hold problem also suggests that a firm life cycle effect under which a firm grows from being a small and acutely opaque firm to a larger informational transparent firm (e.g., Berger and Udell 1998). As it evolves through this evolution we should see a tipping point where growing SMEs break the shackles of their relationship loan (i.e., break the hold-up problem) and switch from a relationship bank to a transactions-based bank that deploys one of the other lending technologies – specifically, the financial statement lending technology that is common in large firm lending. One challenge in testing such a proposition is that while we have a number of data sets on small business finance and we have extensive data on large firm finance, most of these data sets do not span the life cycle – i.e., they do include data on small and medium and large firms. One study finds evidence of this tipping point in the firm life cycle using U.S. data on firms that range from (smaller) midsized firms to very large firms (Gopan, Udell and Yerramilli 2011). That is, firms outgrow their relationship bank and switch to a transactions-based bank where they, among other things, obtain more funding and enjoy an improved growth trajectory.6

One final note on relationship lending is that the KN study may understand the benefits from relationship lending as defined in this paper. In most of the studies in KN the data likely include both relationship borrowers and transactions based borrowers (i.e., borrowers whose banks fund them using one of the other lending technologies). For these latter borrowers, the importance of the relationship is less than the importance of the hard information used in the primary technology. So, this suggests a

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6 Other papers on why firms switch banks include Farinha and Santos (2002) who use Portuguese data and Ioannidou and Ongena (2010) who use Bolivian data. The latter paper also finds that while firms switch in order to obtain lower rates they also tend to get informationally locked in with their new bank.
bias against finding relationship benefits. Thus, the finding in KN of relationship benefits on balance is a particularly powerful result.

**Financial Statement Lending.** Relatively little has been written about this transactions-based lending technology as it applies to SME lending. The reason is simple. Financial statement lending isn’t unique to SMEs. Indeed, financial statement lending is the primary way in which lending is underwritten in commercial lending to large firms. But, neither is it unique to large firms. It is likely deployed in underwriting in the majority of loans to mid-sized firms particularly in the developed world. As defined here (and in Berger and Udell 2006), financial statement lending is based audited financial statements—that is, financial statements that are informative in the sense that the existence of the firm’s assets, liabilities and cash flows have been verified by a third party. Another way to think about financial statement lending to SMEs is that it is precisely when commercial loan underwriting looks the same in the SME sector as it does in the large firm sector. Thus, what we know about financial statement lending in large firm lending is applicable to SME lending.

In this sense we know a lot about SME financial statement lending. For example, a key characteristic of financial statement lending is the employment of covenants and the importance of the renegotiation option that is associated with covenant tightness. Covenants are, for the most part, not feasible in the absence of audited financial statements. The power of covenants written on financial ratios (or other financial event) depends on the veracity of the financial numbers on which are based. Hence, covenants written on company prepared statements or on unaudited statements are essentially covenants written on the shifting sands of unreliability. Thus, in SME research on financial statement lending we can turn to an extensive literature on covenants including the early theoretical literature (e.g., Berlin and Loeys 1988, Berlin and Mester 1993). Moreover, we can rely on more recent empirical work on covenants even though the data used in this work is mostly on large firms (e.g., Chava and Roberts 2004, Drucker and Puri 2008, Gárleanu and Zwiebel 2009, Billet et al. 2014).

Because financial statement lending (as defined here and in Berger and Udell 2002, 2006) depends on reliable financial statements in the form of audited statements, an interesting question arises: Which SMEs choose to obtain an audit by an accounting firm or certified public accountant? A relatively recent paper addresses this question, Ali and Yohn (2009). This paper exploited data on financial statement types in the 2003 Survey of Small Business Finance conducted by the Federal Reserve Board. It is important to put this paper in context. In effect, the Securities and Exchange Commission (SEC) requires that companies who list their securities publically must periodically submit
audited financial statements. These are large firms (or larger mid-sized firms). For most SMEs, therefore, the decision to obtain an audit is a choice. That choice, in turn, depends on the trade-off between the costs versus the benefits from getting an audit. Within the context of the lending technology paradigm the benefits stem from the lower cost of underwriting the loan using the financial statement lending technology and the potentially better precision in assessing risk associated with this technology which could lead to great access to credit and/or a lower price of credit. Specifically Ali and Yohn (2009) examined the decision by SMEs to choose among four levels of auditor association in an ordered probit: i) an audit; ii) a review; iii) a compilation; and iv) company prepared statements. Among other things, the paper finds that the demand for “sophisticated” financial statements is positively related to firm size and firm growth. Interestingly Ali and Yohn (2009) find that getting audit improves an SME’s access to credit (in terms of reducing the probability of loan denial) although they did not find a statistically significant effect on loan rates. We will return to the topic of audited financial statements in the penultimate section of the paper.

Small Business Credit Scoring. Small business credit scoring (SBCS) was adopted in the mid-1990s spreading quickly among large banks in the U.S. and then to other countries and regional banks in the U.S as well. There has been a considerable amount of interest in the adoption of this transactions-based innovation and on how banks have deployed it including its positive effect on out-of-market lending, longer distance lending, and overall access to credit (e.g., Frame, Srinivasan and Woolsey 2001, Frame, Padhi and Woosley 2004, Cowan and Cowan 2006, DeYoung et al. 2007, DeYoung et al. 2008, DeYoung et al. 2011). Somewhat unclear in the literature is whether the extent to which the benefit from lower underwriting costs from using SBCS is partially offset by the reduced accuracy of the credit decision.

Another interesting issue is the precise nature of the innovation itself. The introduction of SBCS is often described in terms of technological progress and banks taking advantage of “improvements in

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7 For more detail see the SEC’s website http://www.sec.gov/investor/pubs/aboutauditors.htm.
8 An alternative way to think about the auditor choice is to view it as a trade-off between the benefits and costs of becoming more transparent.
9 To qualify under our definition of financial statements the statements must be either audited or review. In constructing audited financial statements all of the balance sheet and income statement numbers must be verified and in a review at least some of them are (and these are specified in the review).
10 Ali and Yohn (2009) did find evidence of a statistically effect on interest rates for SMEs organized as unlimited liability firms (e.g., sole proprietorships and partnerships).
11 As Ali and Yohn (2009) they cannot specifically analyze the trade-off between audit cost and benefits because the SSBF does not have data on audit cost (see their footnote 11).
12 See DeYoung (2008), p. 118.
information processing, telecommunications, and financial technologies” (Berger 2015, p. 303). We will turn to this issue in the penultimate section of the paper.

Crowd Funding. This is a new transactions-based technology (about 10 years old) that has generated a lot of interest in the financial and popular press. Some crowd funding is on the debt side and some is on the equity side. It certainly exists in developed economies like Australia and the U.S. However, it is not clear that there is reliable data on the aggregate volume of funding that flows through P2P lending portals. These are “microloans” (e.g., less than $25,000) extended on an unsecured basis by individuals to individuals (i.e., peer-to-peer (P2P) lending with the entrepreneur as the obligor). A recent academic paper that used data on “the biggest market, Prosper.com” states that “Prosper.com has logged over 200,000 listings seeking $1 billion in funding since its inception” and with “by the end of 2008, over $178 million in funded loans (Lin, Prabhala and Viswanathan 2013).” Prospective borrowers post their loan requests online in a form equivalent to a term sheet that includes the loan amount, the maximum loan rate and an optional description. Information from a consumer credit bureau appears to also be provided to potential lenders. Funding can be extruded either through a closed auction (at the requested amount and rate) or an open auction (bidding remains open for a specified period and the rate can be bid down). There is a small but growing body of literature on this technology that includes investigations of lending biases (Ravina 2008, Pope and Syndor 2011), the role of friendships in mitigating adverse selection and information asymmetry (Lin, Prabhala and Viswanathan 2013), and the presence of default information in excess of the hard information associated with the listing (Iyer et al. 2009).

Trade Credit. Trade credit is an extremely interesting component of SME finance, if for no other reason, because it is the second most important source of external SME debt finance (Demirgüç-Kunt and Maksimovic 2001). Berger and Udell (1998) show that in the U.S. trade credit provides 31% of debt financing to SMEs, nearly as much as commercial banks (37%). It is also globally ubiquitous. For example, trade credit provides about 33% of SME debt finance in Spain and about 24% in Japan. Because of its importance it is not surprising that there is a large body of literature on trade credit – too large for a detailed discussion here. A variety of theories have been offered to explain trade credit including (but not limited to) advantages in assessing customer quality, enforcing unsecured debt, signaling product quality, and relationship-based theories of trade credit. Because it is unsettled in the literature

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13 See Lin, Prabhala and Viswanathan (2013) for more detail on Prospect.com’s procedures.
14 For recent discussions of the literature on trade credit including the theories that potentially explain the importance and advantage of trade credit see Giannetti et al. (2011), Uchida and Udell (2013) and Carbó-Valverde, Rodríguez-Fernández and Udell (2014).
the extent to which trade credit is relationship-based it is difficult to classify trade credit as either distinctly relationship-based or transactions-based. There is also an extensive literature on whether trade credit is a substitute or a complement to bank loans (see the prior footnote for a summary of this strand of the literature).

Let me offer two further comments on trade credit. First, given the extensive body of academic literature on trade credit, and the unsettled issues associated with its use, the timing may be right to conduct a meta-analysis of the trade credit literature in the spirit of Kysucky and Norden’s (2014) meta-analysis of relationship lending technology.

Second, it is my sense that there is some confusion in the literature on the cost of trade credit. This issue stems from the fact that there is a widespread assumption in the academic literature that trade credit is considerably more expensive than bank loans. This matters because it may tell us something about the nature of trade credit and because researchers can exploit this differential cost to identify credit constrained firms. The assertion trade credit is extremely expensive appears early in the trade credit academic literature. Smith (1987) notes that sellers’ payment terms can include either a discount if paid early or “a specified period with no prompt payment discount” … or both, i.e., “contracts with credit options (e.g., 2/10 net 30, effectively 44 percent per annum)” (my italics). Smith (1987) offers no citation for this description of the payment terms nor any information on how much these terms might vary. Petersen and Rajan (1994) also noted the 44 percent per annum example (i.e., 2/10 net 30) in order to motivate their identification strategy citing Smith (1987) as the source. While Petersen and Rajan (1994) qualify their assumption that trade credit is expensive by noting that the rate is clearly lower if borrowers are allowed to stretch their payments, they also note “discount terms are not specific to a firm, but common in practice throughout the industry ...(and) discounts and penalties are substantial.”

The problem here is reconciling the assertion that trade credit is extraordinarily expensive with the observed fact that trade credit is nearly as important as bank lending – virtually everywhere in the world. If trade credit were, in fact, 5-10 times more expensive than bank credit it seems implausible that SMEs would depend so heavily on trade credit, including in particular SMEs with access to bank credit. How do we reconcile this inconsistency? First, 2/10 net 30 is not, by any means, the uniform financial terms of trade credit (Giannetti, Burkart and Ellingsen 2011). Second, as acknowledged by Petersen and Rajan (1994), the stated terms are not necessarily the enforced terms. Third, the “all-in” price must incorporate the price of the product as well as the financial terms of the contract.
Importantly, it is highly unlikely that there is any available data set that would allow us to calculate this all-in price.15

If trade credit is, in fact, much less expensive than implied in the literature, how damaging is this to the extant academic literature? In my view the answer is that it depends. The empirical literature that examines differences in trade credit vs. bank credit across firms, or in response to external shocks, depends at most on an assumption about the marginal cost of trade credit, not the average cost. In this regard, the assumption that at some “level” of trade credit usage (i.e., at some level of accounts payable turnover), trade credit begins to get more expensive than bank loans under normal conditions is probably a reasonable assumption. In other words, most of the literature on trade credit and funding constraints including Petersen and Rajan (1994) and recent papers that have looked at trade credit as a safety value during this crisis (e.g., Garcia-Appendini and Montoriol-Garriga 2013, Carbó-Valverde, Rodríguez-Fernández and Udell 2014) are likely on safe ground. The more problematic issue concerns interpreting the costs associated with trade credit and what those costs tells about the unsettled questions regarding the uniqueness of trade credit as a lending technology. Put differently, if the cost of trade credit is indeed 44%, then either trade credit is an exorbitantly expensive lending technology to deliver or vendors are enjoying extraordinarily high rents – neither of which seems particularly plausible.

II.B.1.a. Collateral-based Lending Technologies

The remaining lending technologies are based on quantitative hard information about tangible assets with most of them specifically involving a security interest in the underlying assets (factoring and leasing being the two exceptions with respect to a security interest). Because hard information about the underlying tangible asset is common to all of these lending technologies, grouping them together makes some sense. (This also means that all of these lending technologies are transactions-based.) There are two types of collateral outside collateral and inside collateral. Outside collateral refers to assets that secure an SME’s loan that are not owned by the SME. This is quite common in SME lending and occurs most often when an entrepreneur pledges personal real estate as collateral for her firm’s loan. Inside collateral refers to business assets such as accounts receivable, inventory, plant and equipment owned by the firm that secure a loan to the firm. There is considerable fusion in both the theoretical and empirical literature about these two types of collateral. We’ll defer this discussion until the penultimate section.

15 For a more detailed treatment of this trade credit pricing puzzle see Miwa and Ramseyer (2008).
Among the collateral-based lending technologies asset-based lending strictly involves inside collateral (i.e., accounts receivable and inventory); equipment lending in the vast majority of cases also just involves inside collateral; but, real estate-based lending can involve either inside or outside collateral. Factoring and leasing are separate cases as discussed below. Loan structure also differs among these technologies. For example, asset-based lending is designed for working capital and is typically associated a line of credit (which has no amortization schedule). Alternatively, loans to purchase equipment are virtually always amortizing with the repayment schedule structured to match the depreciating value of the equipment.

Asset-based Lending. As noted above asset-based lending is targeted to relatively high risk, high leverage SMEs with accounts receivable and inventory to pledge as collateral. The loan-to-value (LTV) ratio is applied to the collateral on a daily basis based on changes in the levels of the accounts receivable and inventory. In addition, asset-based lenders rely on their own audit teams rather than external accounting firms. These teams typically conduct field exams four times a year to verify the books and records of the firm and the value – and existence – of the collateral. This is a relatively expensive lending technology. It is also often used in conjunction with SME leveraged buyouts and for distressed firms with a high probability of restructuring. In the U.S. it is typical that an asset-based lender will convert to the debtor-in-possession (DIP) lender who provides the firm with working capital if it goes into Chapter 11 bankruptcy.\(^\text{16}\)

Despite the relatively large size of asset-based lending in the common law countries (i.e., the Australia, Canada, New Zealand, the U.K. and the U.S.) there is relatively little research on this segment of the SME finance market. Interesting exceptions are Klapper (1998) and Carey, Post and Sharpe (1998) who both provide evidence confirming that asset-based loans are riskier and Mester, Nakamura and Renault (2007) who find that the asset-based platform improves monitoring and reduces diversion of funds.

Equipment Lending. Under equipment lending either the loan is used to purchase the equipment or it is used for some other purpose. Typically in the latter case the equipment provides additional collateral to bolster a line of credit or loan secured by other assets (e.g., accounts receivable and inventory, or other equipment). The theoretical literature mentioned above on inside collateral applies directly to equipment lending. It is unusual in SME research, however, to find data that is sufficiently granular to distinguish among different types of collateral so as to break out equipment as a separate category. Exceptions to this include the SSBF (Berger and Black 2011).

\(^{16}\) See Udell (2004) for more details on how asset-based loans are structured.
Real estate-based lending. As noted above, real-based lending is often associated with financing the SME’s headquarters and/or factory in the context of inside collateral. Perhaps equally important – or even more important – real estate is also used as outside collateral where the entrepreneur pledges her house (or other personally owned real estate) as collateral (typically a second mortgage) that secures a loan to the business. 17 Recent research suggests that this can be a significant component of SME financing (e.g., Ono et al. 2015). The recent boom and bust has heightened interest in this type of financing and its link to small business activity. During the boom period when housing prices increased significantly leading up to the crisis this type of lending could account for as much as 10-25% of the increase in pre-crisis employment in the U.S. and significantly increased start-ups (Adelino et al. 2013). The crisis itself had equally powerful effect in the opposite direction. One study found that in the U.K the average small business extracted $.25 out of every dollar of increase in the value of real estate, but the decline in real estate based small business lending during the crisis was responsible for a 9-16% of the drop in a national employment and a 20-27% of the drop in the areas worst hit in the U.K. by a decline in the price of real estate (Kleiner 2014).

Factoring. As noted above factoring shares many similarities with the receivables side of asset-based lending. The key distinguishing factor, however, is that the factor purchases the receivables instead of lending against the receivables using the receivables as collateral. Factoring can either be conducted on a recourse or non-recourse basis with the former being more common in developing economies and the latter more common in developed economies (Bakker, Klapper and Udell 2004). Factoring is often provided in a bundled product suggesting synergies between the financing component (i.e., extension and assessment of credit), risk assumption and collection activities (Bakker, Klapper and Udell 2004). Theoretical work suggests the possibility that factors may have a superior monitoring technology than suppliers (Sopranzetti 1998). It is appears that factors may have an advantage at assessing risk at the underwriting stage driven by economies scale that arises from collecting large databases on payment performance. Research indicates that because the ownership of factored receivables are shifted from the “borrower” to the factor and therefore not part of the estate of a bankrupt firm, factoring may allow high-risk suppliers to shift risk to higher quality buyers (i.e., the factor). This may be particularly attractive in countries with weak commercial laws and enforcement making it difficult to lend against accounts receivable as collateral (Klapper 2007). 18

17 Alternatively the entrepreneur could privately obtain a second mortgage or draw down on home equity line of credit and lend the proceeds to her firm.
18 For a more detailed discussion of the mechanics of factoring, the nature of factoring contracts and the academic research on factoring see Bakker, Klapper and Udell (2004), Udell (2004) and Klapper, Leaven and Rajan (2012).
**Leasing.** Leasing also shares with factoring the feature of transferring ownership of the underlying asset to the “lender”. The academic literature on leasing has shown that it can mitigate adverse selection problems associated with the sale of used and new equipment (Chemmanur and Yan 2000, Hendel and Lizzeri 2002, and Gilligan, 2004). Leasing may also provide a tax benefit motivation (e.g., Graham, Lemmon and Shallheim 1998).

**II.B.2. Lending Technologies and the Lending Infrastructure**

Berger and Udell (2006) argue that a country’s lending infrastructure will determine the feasibility and importance of these lending technologies. This infrastructure includes the information environment (e.g., accounting rules and credit information sharing), the legal, judicial and bankruptcy environments, the social environment (e.g., social capital), the tax and regulatory environment.\(^{19}\) The full list of lending technologies may exist only in a relatively few countries. For example, asset-based lending in its purest form may be limited to a handful of common law countries, specifically Australia, Canada, New Zealand, the U.K. and the U.S. Several necessary conditions need to exist before pure asset-based lending can work. First, there has to be set of modern laws on security interests on moveable assets that specifically allow for a bulk assignment of accounts receivable and inventory.\(^{20}\) Second, there needs to be a modern collateral registration system that “time stamps” the filing of security interests and provides immediate notification to all other creditors (and potential creditors). Ideally this should be a nationwide system. Third, there needs to be sufficiently strong judicial and bankruptcy systems in place that do not deviate from absolute priority and that will convey property rights in the secured moveable assets expeditiously in the event of a default or a bankruptcy filing. In countries where a corporate bankruptcy filing immediately triggers an automatic stay, the bankruptcy system must allow for the simultaneous waiver of that stay with respect to accounts receivable and inventory upon petition by the asset-based lender. Fourth, there needs to be an information sharing mechanism that allows asset-based lenders to efficiently evaluate the quality of accounts receivable. (The necessity for efficient information sharing also applies to factoring.)

While there appear to be only a limited number of countries that now offer asset-based lending, the list may be growing. For example, in the last ten years at least three countries have changed their

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\(^{19}\) For more detail see Berger and Udell (2006).

\(^{20}\) This is sometimes referred to as a “floating charge” or “floating lien”.
lending infrastructure in ways designed to facilitate asset-based lending – China, Japan and Vietnam.\textsuperscript{21} Specifically, these countries adopted a modern set of commercial laws on security interests. In the case of China and Japan both countries appear to have significantly increased lending that is secured by accounts receivable (and inventory in Japan). However, it is not clear that this is equivalent to the way asset-based lending is practiced in the common law countries mentioned above. It may in fact be more akin to “borrowing base lending” which involves lending against (i.e., collateralizing with) accounts receivable and inventory but without the continuous monitoring, or even just taking accounts receivable and inventory as secondary collateral without a borrowing base calculation as may be the case in Japan (Kinjo 2013). More generally, it appears likely that borrowing base lending (where loan levels are calibrated on the level of accounts receivable and inventory but not on a continuous basis) may be much more prevalent than asset lending. In my view, however, borrowing base lending should more properly be viewed as a variant of financial statement lending because the monitoring mechanism that is idiosyncratic to asset-based lending is absent.\textsuperscript{22}

Another interesting example of how the importance of a lending technology varies across countries and how this can change is factoring. For example, in 2002 the ratio of factoring volume to GDP was 11.9\% in Italy while only 0.9\% in Switzerland (Bakker, Klapper and Udell 2004). This could be attributable to the relatively poor bankruptcy system in Italy that encourages financial institutions to “take” the receivables out of the corpus of the firm through factoring and thus out of the estate should the company go bankrupt. Many countries have relatively recently introduced laws allowing factoring such as those in Central and Eastern Europe (Bakker, Klapper and Udell 2004), and more recently Vietnam. Often the impetus for the introduction of factoring is to facilitate export financing (e.g., ANZ financing Australian receivables for a domestic Vietnamese firm).\textsuperscript{23,24}

\textbf{II.B.3. More on the Lending Technologies Paradigm}

\textsuperscript{21} The author’s textbook, Udell (2004), has been published in Japanese and key excerpts have been translated into Chinese and Vietnamese in conjunction with workshops on asset-based lending presented by the author in China and Vietnam respectively. For more information on the Chinese case, see for example IFC (2012).

\textsuperscript{22} Cerqueiro, Ongen and Roszbach (2014) analyze the impact on credit associated with a change in Swedish commercial law that diluted the strength bulk assignment of (i.e., the “floating lien”) accounts receivable and inventory.

\textsuperscript{23} ANZ was given permission to factor receivables in Vietnam through its affiliate, ANZ Bank Vietnam, in 2011.

\textsuperscript{24} There has been a considerable amount of research recently (i.e., since the SME finance literature overviews in Berger and Udell 1998 and 2006) on lending infrastructure issues particularly in area of judicial and bankruptcy infrastructure (e.g., Djankov, Hart, McLeish and Shleifer 2008, Haselmann, Pistor and Vig 2010, von Lilienfeld-Toal, Mookherjee and Visaria 2012, Gennaioli and Rossi 2013, Rodano, Serrano-Velarde and Tarantino 2013, Vig 2013).
The concept of “lending technologies” was first introduced to the academic literature in Berger and Udell (2002) and later refined in Berger and Udell (2006). But, how powerful is the paradigm? In part, its power derives from the distinctiveness of the lending technologies. Intuitively, the transactions based technologies derive their “uniqueness” from the nature of the hard information associated with each of them. For example, on the hand the hard information on which an equipment loan is based is in the form of quantitative information contained in the equipment appraisal – most importantly, the appraised value of the equipment. On the other hand, the hard information in an SBCS loan is the credit score generated by the scoring model used by the lender. These are clearly quite distinct forms of hard information.

An important implication of the lending technologies framework is that it recognizes that lending markets include a number of alternatives to relationship lending in providing financing to SMEs. This is important, as noted above, because the early academic literature on opacity and bank lending tended over simplify the lending landscape. Specifically it tended to implicitly view all bank lending as being soft information-driven. In this view of the world smaller, opaque firms got relationship loans from banks and large firms got arms-length debt financing from the corporate bond market. Consistent with the lending technologies paradigm, recent empirical academic literature on SME financing has found that the transactions-based lending technologies, like leasing, equipment lending and factoring play a vital role in providing credit to SMEs (e.g., Bakker, Klapper and Udell 2004, de la Torre, Peria and Schmukler 2010).

The inherent differences in the nature of the information used in these technologies may also be associated with significantly different costs. For example, relationship lending is highly labor-intensive and thus costly while underwriting costs associated with SBCS are quite low. Definitive evidence of this is difficult to generate because the balance sheets of bank financial statements do not distinguish between relationship-based loans and transactions-based loans. This difference between the low cost of transactions based banking (which includes transactions based loans) versus the high cost of personalized banking (which includes relationship lending) is formalized in the strategic framework presented in DeYoung, Hunter and Udell (2004). In this strategic model, technological innovation has driven large banks toward delivering standardized transactions-based products (including transactions-based loans) where they can enjoy economies of scale while small banks have moved to specializing in personalized products including relationship loans which are costly to deliver. This paper finds evidence broadly consistent with this hypothesis. Specifically, they find a higher net interest
margin for smaller banks which would be consistent with compensation for the higher cost of delivering relationship lending and other personalized products.25

Also, if these technologies are sufficiently distinct, then there may be scale efficiencies associated with delivering them (or some of them) in organizationally distinct units within lending institutions. Anecdotally this appears to be the case -- at least for some these technologies. For example, banking organizations typically offer asset-based lending through separate units or divisions within the bank. For example, JP Morgan Chase offers asset-lending in its Chase Business Credit division of Chase Commercial Banking.26 I would suspect that banks that offer factoring typically provide factoring through a separate unit because of the unique nature of factoring.

The possible presence of organizational diseconomies further suggest that we might see these technologies delivered by different types of lending institutions. This also appears to be the case. Much of the empirical and theoretical literature argues that relationship lending may be best delivered through small banks rather than through the hierarchical structures of large, complex banks (e.g., Stein 2002). We turn in the next section to a discussion of SME lending channels that exploits the observed differences in the type of organizations that deliver these lending technologies. This will motivate the concept of “SME lending channels”. This concept provides a potentially powerful lens through which we can frame how lending technologies are delivered. It also offers a useful paradigm through which we can analyze how shocks to the financial system might affect the flow of funding through different lending technologies provided by different lending institutions given that some lending institutions may be affected more than others by these shocks. We now turn to a discussion of SME lending channels.

III. SME Lending Channels and the Literature on SME Finance

III.A. The SME Lending Channels Paradigm

Taketa and Udell (2007) introduced the concept of SME lending channels as a useful paradigm with which to analyze the impact of the Japanese banking crisis on SME credit. This paradigm builds on the lending technology paradigm by adding another dimension. That is, an SME lending channel is a two dimensional concept that pairs a lending technology with a type of financial institution that offers the technology. Figure 2 shows the SME lending channels that existed in Japan in 1990 just before the

25 Carter, McNulty and Verbugge (2004) find that the risk-adjusted yield on small business lending is higher at smaller banks than large banks which would also consistent with large banks delivering lower cost transactions-based loans.
beginning of the “lost decade”. The lending technologies are on the vertical axis and the financial institutions that provide SME financing are on the horizontal square. The (green shaded) cells designated with an “o” indicate an operative SME lending channel. Note that not all lending technologies are offered by all types of lenders. Specifically, the grey shaded cells indicate that this particular lending technology is not offered by this particular type of lender. For example, relationship lending is not offered by the largest banks in Japan, the City Banks, and trade credit is only offered by corporations. In 1990 there appear to have been 8 lending technologies available to SMEs in Japan.

Contrast the Japanese case in 1990 with the U.S. case today (Figure 3). The technologies are different because of the introduction of two new technologies, SBCS and crowd-funding, and the absence of one of the lending technologies, Sogo Shosha lending. But, also the lenders are different because of the difference in the financial institutions structure between Japan and the U.S.27 In the U.S. commercial finance companies are important players in the SME market targeting the provision of four of the transactions-based lending technologies -- ABL, factoring, equipment lending and leasing. Some of these finance companies are quite large like GE Capital and CIT. But there are also quite a few small commercial finance companies (Udell 2004). Credit unions are now also active in SME lending. Credit unions had been barred from commercial lending until relatively recently.

Note that both in Japan and the U.S. large banks do not provide relationship lending reflecting the balance of the theoretical and empirical literature. SBCS is shown as being provided exclusively by large banks although I suspect that there are a relatively small number of small banks who use this technology.

III.B. SME Lending Channels and Macro Shocks

One of the key advantages of the SME lending channels paradigm is the way it can be used to frame how financial shocks may affect SME access to credit. The paradigm allows for the possibility that some SME lending channels may contract significantly during a credit crunch while others may not. Moreover, some channels may even expand helping to offset the pain inflicted by contracting channels. The 1990-1992 credit crunch in the U.S. and the recent financial crisis provide useful examples. Let’s first consider the 1990-92 U.S. credit crunch. A considerable amount of research found evidence of a significant of a credit crunch at that time (e.g., Dunkelberg and Dennis 1992, Avery et al. 1998, Hancock and Wilcox 1998). A number of different hypothesis about the cause of this credit crunch have been proposed. On balance the research finds support for several of these including regulatory over-

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reaction (from the recent savings and loan crisis), imposition of regulatory leverage ratios, and capital shocks due to loan losses (Berger and Udell 1994).28

Figure 4 shows what SME lending channels may have looked like during the 1990-92 credit crunch. Note first that two relatively new lending technologies that exist today in the U.S., did not in 1990-92. Also, two lending institutions did not provide SME financing at that time. These technologies and lenders are accordingly blocked (blacked) out. The evidence suggests that large banks were particularly hard hit by the macro shock which may have been exacerbated by regulatory changes associated with the collapse of the leveraged buyout market. Accordingly the large bank lending channels are designated with an “x” and red shading indicating that these banks contracted their lending. The assumption here is that it affected all of the lending channels offered by large banks and all of these channels contracted about equally.29 Many small banks were also several affected and one study found more sensitivity to capital shocks in small banks than in large banks (Hancock and Wilcox 1998). The small banks’ cells, however, are designated with a “−” shaded yellow reflecting (the likely) more heterogeneity in capital shocks across the small bank component of the banking system (i.e., many small banks remained healthy). Perhaps the most interesting aspect of Figure 4 is the commercial finance company cells – both large and small commercial finance companies. It appears that commercial finance companies may have lent more money as SMEs got churned out the banking market. This may have actually increased the quality of their loan portfolios which historically reflected a riskier class of SMEs.30 Unfortunately there isn’t sufficiently good data on commercial finance company portfolios to test this proposition. However, discussions with senior managers of these firms are quite consistent with this hypothesis (see Udell 2004). I am not aware of any studies on trade credit during the 1990-92 credit crunch. However, based on subsequent research on how the trade credit channel behaved during this crisis this SME lending channel is open based on the conjecture that like the commercial finance company channels it may have actually expanded.

Now let’s consider what happened to SME lending during the current financial crisis. As in all crises, separating demand effects from supply effects is a key challenge. Occasionally natural

29 While this assumption seems reasonable, we should emphasize that data on most of these lending technologies is not available. Bank financial statements don’t break out the commercial loan portfolio (i.e., the C&I portfolio) into subcategories. Moreover, even in datasets that provide more information about bank loans the distinctions aren’t granular enough to break out the lending technologies used. For example, some data sets such as the Federal Reserve’s Survey of the Terms of Bank Lending indicate whether a loan is secured, but do not indicate the type of collateral which would identify the lending technology.
30 For evidence on the average differential risk between the commercial bank loan portfolios at banks versus commercial finance companies see Carey, Post and Sharpe (1998).
experiments present themselves that opportunistically create powerful identification strategies (e.g., Peek and Rosengren, 1997; Khwaja and Mian 2008; Chava and Purnanandam 2011; Lin and Paravisini, 2013). Unfortunately this crisis hasn’t offered experimental laboratories such as these. As it turns out the best opportunities for the empiricist to investigate the nature and severity have been in Europe, not the U.S. because of data availability. Specifically, many countries in Europe have credit registries that contain panel information about firms, their loans and even (in some cases) some information about their loan applications. The best data in the U.S. had been, until the crisis, the Federal Reserve’s Survey of Small Business Lending (SSBF). Although the SSBF does not contain panel data, it does contain rich information about the firm and its loans. However, the Federal Reserve discontinued the SSBF just before the crisis started. Thus, while the U.S. was decreasing its investment data (i.e., discontinuing the SSBF), Europe was increasing its investment in data after the crisis began (e.g., the ECB/European Commission’s SAFE dataset).

Researchers have exploited these European data sources to identify supply effects using disequilibrium models to identify credit constrained borrowers (e.g., Carbo-Valverde, Rodriguez-Fernandez and Udell et al. 2014; Kremp and Sevestre 2013) or to control for demand effects by looking at access to credit by firms with multiple lenders (e.g., Albertazzi and Marchetti 2010; Jimenez et al. 2012, Iyer et al. 2013). Yet another approach is to use survey data that provides information that reveals credit rationing. Some of these were single country studies (e.g., Pigini et al. 2014; Presbitero et al. 2014) some have conducted cross-country analyses (e.g., Popov and Udell 2012, Beck et al. 2014, Ferrando, Popov and Udell 2015). Overall these studies have found, among other things, evidence of a significant credit crunch with a bigger effect associated with banks under more stress and in countries under more stress.

So based on what we know in Europe about SMEs and what we know about banks in the U.S., we can conjecture about what happened in the U.S. during this crisis to the SME lending channels using the SME lending channel paradigm. Figure 5 reflects the fact that both large and small banks were significantly affected by the crisis. Initially large banks suffered a massive shock related to the subprime residential mortgage market which began hitting bank capital in the fall of 2007. About 18 months later small banks got hit by losses in their commercial real estate and construction loan portfolios. Thus we conjecture that both the large and small bank lending channels contracted. While, as we just noted, direct evidence on this is not possible in the U.S., this conjecture is generally consistence with available

311 The best firm-level surveys ask whether firms sought credit (and whether they were discouraged from applying) and whether they received what the asked for.
“indirect” evidence of a significant supply effect that included small banks (e.g., Duygan-Bump et al. 2010, DeYoung et al. 2014).32

Figure 5 shows a contraction by commercial finance companies. Direct evidence on this is probably not possible. But anecdotal evidence points in this direction. At least one large independent commercial finance company went bankrupt, CIT. GE Capital suffered significant losses during the crisis and “since 2008 ... has reduced the size of its balance sheet” 33,34 The problem was further exacerbated by the fact that since the financial crisis many of independent commercial finance companies were acquired by commercial banking organizations losing their independence including prominently Congress Financial. Congress Financial is important because it was acquired by Wachovia which failed. Consequently it seems likely that commercial finance companies could not have served in the role of safety value as they did in the 1990-92 credit crunch. Thus, it is likely that the large commercial finance company lending channels indeed contracted (Udell 2009). I have seen no evidence on the condition of small commercial finance companies and have left these channels open. But further investigation of this channel would certainly be valuable – but extremely difficult to conduct.

Credit unions were much less affected but their penetration into the SME loan market probably precluded them from providing a significant safety value for SMEs crunched out of the bank market. Moreover, while credit unions are allowed to make commercial loans there is a cap of 12.5% on the on business lending as a fraction of the institution’s assets.

Trade credit likely played a significant role as a safety valve in the sense that the lending channel likely expanded. Data on SME trade credit usage is unavailable in the U.S. However, data on large company provision of trade credit is available. Research exploiting these data found that large firms with strong liquidity tended to provide more trade credit during the crisis (Garcia-Appendini and Montoriol-Garriga 2013). It’s likely that a significant part of this went to the SME sector. Further, evidence in another country confirmed that this happened elsewhere during this crisis. In a study that had access to SME usage of trade credit in Spain found that credit constrained firms substituted trade credit for bank loans when they got crunched out of the bank loan market (Carbó-Valverde, Rodríguez-Fernández and Udell 2014).

32 There is strong evidence of a contraction of supply for larger firms in study that looked at the substitution between bank loans and corporate bonds (Duygan-Bump et al. 2010). Given that SMEs have fewer choices (because they lack access to the capital markets) and are more opaque, it is quite likely that if large in the U.S. suffered a contraction credit supply the situation was even worse for SMEs.
33 See quote from a GE Capital spokesman Susan Bishop in the Wall Street Journal (Mann and McGrane 2014).
34 GE Capital has been designated a systemically important financial institution under the provisions of the Dodd-Frank Act.
The SME lending channel paradigm is also useful in illustrating how the financial crisis may have propagated from the U.S. and Western Europe to Central and Eastern Europe. Recent research shows that multi-national banks that were most affected by balance sheet shocks associated with the crisis tended to reduce SME lending in their foreign subsidiaries in Central and Eastern Europe more than their domestic counter parts in their host countries (i.e., they reduced their supply of credit more than domestic banks that suffered comparable negative shocks to their balance sheets). This effect was compounded by the fact that the banking systems in most of these Central and Eastern Europe became dominated by foreign bank subsidiaries (Popov and Udell 2011). That is, this foreign bank effect was disproportionately large because the banking systems in these Central and Eastern European countries were disproportionately foreign-owned (see Figure 7). Figure 6 shows how SME lending channels in one such country, Croatia, may have looked during the crisis.

III.C. Credit Multipliers

Policymakers have sought to expand SME access to credit by encouraging programs that could best be called “credit multipliers”. These are programs that enhance the flow of funding through one or more of the SME lending channels discussed above. The two principal credit multipliers are guarantee schemes and securitization. These have mostly been implemented either directly or indirectly by government sponsors. Government guarantee schemes have been around for quite some time and are common in both developed and developing economies. SME securitization is a much more recent phenomenon. The efficacy of these two credit multipliers is still an unsettled issue in the academic literature. We will return to a discussion of each of these in the next section.

IV. What We Don’t Know: A Top Ten List

Everybody loves a “top 10” list. In that spirit I offer my own take on the top 10 ten unsettled issues in SME finance. I admit that there may be some bias in this list (i.e., I’m currently working on some papers on topics on this list). But, my main purpose is to provoke some discussion about issues that are “under-researched”. I also freely admit that there are many other issues that likely deserve inclusion in the “top 10”.

1. Testing the SME lending technology and the SME lending channel paradigms
As we noted above most of the empirical literature on SME loan contracting has focused on specific contract features such as collateral, personal guarantees, covenants and commitments. While we have learned a lot from this literature, we may be missing the broader point. If SME access to finance is primarily driven by unique combinations of these contract features in the form of lending technologies - and by the financial institutions that provide these lending technologies (and, hence the SME lending channels), then empiricists may be focusing on the wrong unit of observation. The SME lending channel hypothesizes that lenders underwrite and monitor loans using distinct lending technologies and that these technologies may be delivered by distinct types of institutions. There is an emerging literature that examines SME access to finance through this lens as alluded to above. This approach faces a significant challenge because of data limitations: in general firm survey data and bank financial statements generally do not categorize SME lending in ways that necessarily allow empiricists to distinguish among the channels that exist in specific countries – even though the lending technologies may be delivered by distinct units within a financial organization or by financial organizations that specialize in one lending technology.

Some of the literature that speaks to lending technology paradigm has focused on specific lending technologies (i.e., a single lending technology). For example, data availability on trade credit has facilitated a considerable amount of research on factoring. This literature has explored the essence of this technology (e.g., Giannetti et al. 2011) and cross country differences in its importance (e.g., Bakker, Klapper and Udell 2004, Klapper 2007). Data in the U.S. has allowed an analysis of asset-based lending delivered by commercial finance companies in the U.S. (Carey, Post and Sharpe 1998). More recently there has been research that has examined the SME lending technology in a more holistic way. These include papers that focus on the distinctiveness (i.e., uniqueness) of the technologies (Uchida, Udell and Yamori 2008, Berger and Black 2009) and papers that have examined the importance of large banks and foreign banks who deliver a portfolio of transactions-based lending technologies (de la Torre, Peria and Schmukler 2010, Beck, Ioannidou and Schafer 2012).

On balance, however, the paucity of within-country data and cross-country data have severely limited the ability of empiricists to analyze key implications of the lending technology paradigm including the trade-offs among the technologies offered within a country and the precise reasons why the provision of these technologies may differ significantly across countries. The cross-country dimension is particularly interesting because policymakers need to understand how best to develop

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35 See Berger and Udell (1998) for a review of this literature on contracting.
lending infrastructure in order to optimize the efficiency of existing lending technologies and create the optimal environment for the introduction of technologies not currently present.

Multinational organizations, such as the International Finance Corporation have assumed an important role in introducing lending technologies into developing economies – for example, asset-based lending in China and Vietnam. However, it is my sense that at this juncture the data do not exist to adequately measure the adoption rate of the asset-based lending technology. For example, China introduced a modern set of laws on security interests in moveable assets such as accounts receivable, thus facilitating the introduction of asset-based lending. As noted earlier, this may have led to a considerable increase in the fraction of SME loans secured by accounts receivable, but without better data it would be difficult to assess whether these loans were delivered through an asset-based loan platform rather or whether these were financial statement loans now supported with a floating charge on accounts receivable.\(^{36}\)

Similarly, analysis of the SME lending channel paradigm is constrained by a lack of data. Here there are at least two big issues. First, which lending technologies are confined to which types of financial institutions? Second, how do these channels behave during a shock like the recent financial crisis? We touched on both of these earlier in the paper. Creative use of existing data sources has allowed research to make some progress on each of these. Much more is needed.

With respect to the first issue, probably the most progress has been made on the issue of whether small banks have an advantage over large banks in delivering relationship lending as predicted in the theory literature and that large banks lend to SMEs via transactions lending (e.g., Berger et al. 2005, Berger, Rosen and Udell 2007, de la Torre, Martinez Peria and Schmukler 2010, Beck, Demircigüzel-Kunt and Martinez Peria 2011, Kano et al. 2011). However, inconsistent with the theoretical literature there is at least one paper that suggests that large banks do not necessarily have a comparative advantage in delivering transactions based lending technologies due to economies of scale (Uchida, Udell and Watanabe 2008).

It is with regard to the second issue that the paucity of research is most acute. As we have noted above there is no data with which to analyze whether key channels such as the commercial finance company asset-based lending channels expanded during the 1990-92 U.S. credit crunch even

\(^{36}\) As may be the case, as discussed above, with respect to research on the introduction of asset-based lending in Japan or even just taking accounts receivable and inventory as secondary collateral as may be the case of Japan (Kinjo 2013).
though industry participants assert that this happened to a very economically significant degree.\textsuperscript{37} Likewise there is no data to assess the extent to which large commercial finance companies (or possibly small commercial finance companies) contracted their asset-based lending (and other SME lending channels) during the recent finance crisis. About all we know is that several large commercial finance companies were in significant financial distress (e.g., CIT and GE Capital). We know virtually nothing about small commercial finance companies - including whether they were in distress, much less whether they expanded or contracted their lending.\textsuperscript{38}

As a consequence it is very difficult to assess the overall extent, nature, and impact on SMEs of the recent credit crunch in the U.S. The study that probably comes closest used bank-level data in the context of a structural model of bank portfolio lending finding evidence that smaller “community” banks contracted their supply of credit (DeYoung et al. 2014). Because small banks also likely offer transactions-based lending technologies this doesn’t narrow the analysis down to the specific small bank relationship lending channel. However, evidence outside of the U.S. suggests that smaller banks may have contracted this channel less. In particular, one study found in Germany that savings hit by the shock of this financial crisis contracted relationship loans less (Puri, Rochell and Steffen 2011).

Loan-level and firm-level data in Europe have allowed a much more granular analysis of the credit crunch in the SME sector than in the U.S. (e.g., Jimenez et al. 2012, Iyer et al. 2009, Ongena, Peydro and Van Horen 2013, Ferrando, Popov and Udell 2015). With regard to analyzing the specific lending channels the European data, again, are richer particularly with respect to the analyses of two SME lending channels. Firm level data on accounts payable allowed for the analysis of the trade credit channel in Spain. Specifically these data were used to examine (as we noted earlier) the substitutability of trade credit for bank loans Spain before and during the crisis (Carbo-Valverde, Robriguez-Fernandez and Udell 2014). Firm- and loan-level in Germany facilitated the analysis of the savings bank-

\textsuperscript{37} Historically, insurance companies have provided long-term fixed rate financing to larger mid-size firms in the form of private placements. During the 1990-92 the Board of Governors of the Federal Reserve commissioned a two-year project to study of the private placement market about which little was known to researchers and policymakers. The study was commissioned to conduct a broad analysis of the private placement market (which had not been done in 20 years) and to assess assertions that there was a significant credit crunch in this market. Regarding the credit crunch, the project confirmed the existence of a severe credit crunch (Carey et al. 1993a,b). For the most part private placements were targeted to firms that were on average larger than the typical definition of SMEs so this channel was not included in Figure 4. However, an argument could be made that some larger SMEs were victimized by the contraction of supply in the private placement market and, therefore, this cell should be included in Figure 4.

\textsuperscript{38} One exception, noted in Section II.B.1.a., is the analysis of the trade credit lending channel in Garcia-Appendini and Montoriol-Garriga (2013). Even here, however, the authors don’t specifically look at SME trade credit because they can’t disentangle overall trade credit extension from the smaller subset of trade credit extended to the SME sector.
relationship lending channel noted just above (Puri, Rochell and Steffen 2011). A recent study exploited a new data set that distinguishes among banks that offer relationship lending and those that do not (Beck et al. 2014). This study used the Banking Environment and Performance Survey (BEPSS II) that surveyed 400 bank CEOs in central and eastern Europe and asked them about the importance of different loan underwriting techniques including “relationship lending” and “fundamental and cash-flow analysis” (i.e., financial statement lending). Combining this data set with firm survey data (BEEPS data) this study found that relationship lending alleviated credit constraints during the crisis. However, with respect western Europe (and the other SME lending channels in eastern and central Europe) we know relatively little. So, for example, we do not know the extent to which factoring offered by a large commercial finance company in France (e.g., Coface) provided a potential safety valve for a credit contraction in the large and small banking lending channels in France.

2. Identification Strategies

The biggest challenge in studying how SME access to finance is affected by macro-shocks is sorting out demand effects and supply effects. The problem, of course, is that during a credit crunch it is quite likely that an aggregate economic slowdown with will decrease SME demand for credit. So, identification is critical. The four most popular methods for identifying supply effects are: natural experiments (e.g., Peek and Rosengren 1997, Khwaja and Mian 2008); firm fixed effects in multi-bank settings (e.g., Albertazzi and Marchetti 2010, Jimenez et al. 2011, Iyer et al. 2013); loan application data (e.g., Puri et al. 2011, Popov and Udell 2012, Ongena et al. 2013, Presbitero et al. 2014); and, disequilibrium modeling (e.g., Carbó-Valverde, Rodríguez-Fernández and Udell 2014).

At first blush this looks like a long and rich list of options for the empiricist. However, on closer inspection this list is not long enough. Each of these approaches is associated with limitations. First, natural experiments do not happen very often – and have not presented themselves in this crisis. Second, the firm fixed effects approach involves looking at the same firm when it borrows from two (or more) different banks and when one bank is “shocked” and the other is not. This has the enormous virtue of controlling for demand effects by holding the firm constant. But, it has two big drawbacks. It is not applicable in countries where single-bank SME relationships dominant such as the U.S. And, it is not clear that we can extrapolate from multi-bank financial systems such as Italy, Portugal and Spain to financial systems like the U.S. because the nature of the financial system architecture may be fundamentally different. For example, the multibank structure of these multibank financial systems may

39 See Bolton et al. (2013) for a theoretical model of the role of relationship banks during financial crises.
be driven by fragility of the bank system in these countries (Detragiache, Garella and Guiso 2000). Identification through loan applications, particularly from firm survey data, is often associated with a lack of sufficient firm-level and control variables and sometimes a lack of a direct link between the borrower and the bank. Finally, disequilibrium models are challenging to calibrate.

While the empirical innovation in the area of identification – both in terms of data and modeling – have been impressive, the importance of this area requires more work on expanding the identification “toolbag” and on assessing the relative power of the existing tools.

3. **Hardening Soft Information**

Theory argues that organizational form affects internal communication within the banking firm which, in turn, affects the product menu that banks can offer. Specifically, communication of soft information within large, hierarchical and complex banking institutions is problematic making it difficult to deliver relationship lending (Stein 2002). As noted above, consistent with this theory empirical research generally (but not always) finds that smaller banks are better at relationship lending than larger banks. Moreover, research using more granular data finds that borrower proximity facilitates soft information production (Agarwal and Hauswald 2010), that soft information gets diluted as it is communicated through more hierarchical layers (e.g., Liberte and Mian 2009), and that soft information gets diluted through a longer distance between the originating bank branch and the bank’s headquarters (e.g., Allesendrini, Presbitero and Zazzaro 2009).

An important and unsettled issue in the SME finance literature is what are the boundaries of soft information communication and how much has technological innovation changed those boundaries. This is very closely related to the issue of loan officer discretion in the sense that more loan officer discretion allows loan officers to incorporate more soft information into their loan underwriting. There is a growing body of literature on discretion that shows that discretion may vary according to loan and borrower characteristics (e.g., Cerqueiro, Degryse and Ongena 2011) and discretion can induce manipulation by the loan officer (e.g., Brown 2013, Mosk 2014).

It is widely asserted that technology has significantly altered not only the way banks operate, but also the way they lend to SMEs (e.g., Berger 2015). This is sometimes referred to as the “the

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40 The distance between the branch and the headquarters has been referred to as the “functional distance” (Allesendrini, Presbitero and Zazzaro 2009). Functional distance has also been shown to be importance during the financial crisis where a bank’s contraction of the supply of credit was positively relative to the functional distance of lender to the lender’s headquarters (Presbitero, Udell and Zazzaro 2014).
‘hardening’ of small business lending over time’.\textsuperscript{41} This assertion is typically supported with two examples in the literature: the growing distance between borrowers and lenders (Petersen and Rajan 2002, Wolken and Rodhe 2002) and the introduction of SBCS. The distance argument goes like this: technological innovation has increased the ability to use hard information which has enabled banks to lend when borrowers are farther away from their loan officer or their bank branch (i.e., at a longer “operational distance”) and when branches are located further away from the headquarters where the final lending decision may be made (“functional distance”). While this could be true, the evidence in the literature on the observed changes in distance (i.e., Petersen and Rajan 2002, Wolken and Rodhe 2002) is not particularly convincing because the changes in distance have not been particularly large. It may also be true that these changes in distances have been associated with only one or two lending technologies (e.g., SBCS). So the issue of whether increases in operational distance indicate a significant effect of technology on SME lending is an unsettled issue in great part because that these distances have not changed much and it is not clear whether they affect lending technologies beyond SBCS and crowd funding.\textsuperscript{42}

Turning to the issue of SBCS and the “hardening” of information: The discussion in the literature is not so much about whether this new technology has transformed a particular type of information from soft to hard, but rather about whether hard information technologies are displacing soft information technologies (e.g., SBCS replacing relationship lending). Thus, the “hardening” label is bit misleading. In my view, this suggests that there are really two unsettled issues related to this. First, have hard information transactions-based lending technologies displaced relationship lending beyond micro-business lending (i.e., beyond SME loans below $100,000 that can be credit-scored in a SBCS platform)? Second, can technological innovation ultimately convert some soft information into hard information that can be transmitted within a large complex bank? Many banks, for example, incorporate loan officer qualitative evaluations of management and strategic assessments into the loan score. That is, soft information is mechanically quantified into the score itself (e.g., loan officer may be asked to rate a manager’s skills on a 1 – 5 scale and that numerical rating is quantitatively incorporated into the loan score). Of course, at a more fundamental (i.e., mechanical) level if loan officers incorporate soft information into the pricing of a loan through their discretion, then soft information has been effectively “quantified” into a soft information component of the loan price. Moreover, the empiricist through reverse engineering can tease out this quantified (soft information) component of

\textsuperscript{41} Berger (2015), p. 303.

\textsuperscript{42} Berger (2015) notes that the change in median distance between SMEs and their bank in Wolken and Rodhe (2002) between 1993 and 1998 was only one mile.
the loan price (e.g., Agarwal and Hauswald 2010, and Cerquerio, Degryse and Ongena 2011). But, I would assert that this is not same thing as “hardening soft information” in a way that can be transmitted through the hierarchical layers (and functional distance) within the banking organization. That is, in the spirit of Stein (2002) soft information is only “hardened” to the extent that its value is not diluted as it is transmitted through the banking organization. It has not been established in the academic literature whether technological innovation has facilitated this type of hardening. That is, it has not been established in the literature whether this codification of soft information can be successful transmitted through the hierarchical structure of a bank in a way that does not dilute is content and impact.

4. **Confusion over collateral**

Despite a rather long literature on collateral it is my view that there still persists in the literature a misunderstanding of collateral in the context of SME lending. And, related to this misunderstanding, there is still need for more research on this important contracting tool. As we noted above in motivating the lending technologies paradigm many of the transactions-based technologies are built around specific types of assets that can be pledged as collateral.

The biggest confusion in the academic literature on collateral is related to the distinction between “inside” and “outside” collateral. This distinction was emphasized in Berger and Udell (1998) in their discussion of collateral and guarantees. Inside and outside collateral are quite different. As noted above inside collateral refers to assets pledged as collateral that are owned by the business itself (i.e., an asset inside of the business). Outside collateral refers to assets pledged as collateral that are owned by someone outside of the firm in order to secure the loan to the entrepreneur’s business. This “someone” is almost always the entrepreneur. (If it’s not the entrepreneur, it is typically friends or family of the entrepreneur.) This is very common in SME lending throughout the world and often involves the entrepreneur pledging her residence as collateral.43 More fundamentally, the two types of collateral have a very different mechanical effect on loan payouts. In the case of inside collateral, the act of filing a security interest (i.e., taking collateral) in a business asset changes priorities in liquidation. The secured creditor benefits at the expense of the unsecured creditors. In an Modigliani and Miller (M&M) world the benefit to the secured creditor would be exactly offset by the increased exposure incurred by the unsecured creditor(s) and the average cost of capital would be unaffected, i.e., the interest rate would fall on the secured loan and the interest rate would rise on the secured loan(s) in zero-sum game.

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43 Outside collateral is essentially irrelevant in lending to large firms because they are atomistically owned.
In contrast outside collateral pierces the veil of limited liability by increasing the exposure of the entrepreneur. The secured creditor benefits – but not at the expense of the other creditors. In effect, outside collateral is like a synthetic injection of equity into the firm. Indeed, in an M&M world the entrepreneur could costless sell her personal assets (that would otherwise be pledged as collateral) and simply inject the proceeds into her firm as equity. Frictions in the world that deviate from M&M, however, make this costly.

The specific source of the confusion is that both the theoretical literature and the empirical literatures conflate the two types of collateral. Consider first the theoretical literature. There is a considerable amount of academic theory on outside collateral and it is probably fair to say that we understand a great deal about why it exists. In contrast there is very little theory about inside collateral and, in my opinion, we know very little about why it exists (and why it is ubiquitous). One problem arises in part because many theory papers on outside collateral imply that their models apply to all collateral. Put differently, these papers don’t include a disclaimer saying that “the model only applies to outside collateral”. Confusing the two types of collateral is problematic because inside and outside collateral have very different incentive and signaling effects. Simply put they have very little in common with each other.

Another source of confusion in the theoretical literature relates specifically to inside collateral. Inside collateral is mostly irrelevant if there is only one lender. In a single lender world the lender already has a claim on all of the proceeds from liquidation. Put differently, in bankruptcy inside collateral only matters in a multi-lender environment because mechanically the only effect of filing a security interest is to rearrange priorities in liquidation – and the concept of priority requires at least two lenders. I regularly see papers that claim to say something about inside collateral using a model with one lender. My sense is that this can be traced back to the macroeconomics literature and Kiyotaki and Moore (1995) and Bernanke, Gertler and Gilchrist (1996). Both papers use single-lender models that refer to the single lender’s claim on a fixed factor of production as “collateral”. The papers are not incorrect, but the power of collateral in these models is quite limited. It prevents the entrepreneur from absconding with the assets that are pledged as collateral. It has nothing to do with rearranging priorities in bankruptcy. This control feature of collateral is real and exists in developed economies with respect to specific kinds of assets. For example, in the U.S. firms cannot sell equipment (and pay the entrepreneur/owner a dividend) if a security interest has been filed under the Uniform Commercial

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44 These papers do not need to assume security interest (i.e., a collateral interest) in the fixed factor if the already assume a single lender world. They only need to assume that the entrepreneur cannot walk with the plant and equipment.
Code uniquely identifying the pledged equipment with a serial number. However, this control feature does not work over moveable assets such as accounts receivable and inventory because they are fungible (as recognized in Kiyotaki and Moore 1995, and Bernanke, Gertler and Gilchrist 1996). Thus, this passive control feature of collateral cannot explain why banks routinely take accounts receivable and inventory as collateral. Moreover, it has not been demonstrated in the empirical literature whether the control feature is economically important with respect to fixed assets.

Turning to the empirical literature, confusion arises because many papers attempt to test specific theories of inside and outside collateral without being able to distinguish between these two types in the data. Many data sets just have a zero-one variable for collateral (e.g., the Federal Reserve’s Survey of Terms of Bank Lending). This is quite problematic because many of signaling theories of outside collateral (the bulk of the theoretical work on collateral) predict a negative relationship between borrower risk and pledging collateral while the bulk of the empirical literature finds a positive relationship between pledging collateral and borrower risk. However, because most of data sets used in the empirical literature do not distinguish between inside and outside collateral, the findings cannot be viewed as a rejection of these models on outside collateral.

So, in summary there needs to more theoretical literature on inside collateral to better understand why it is so common in SME lending; and, there needs to be more empirical research that specifically tests theories of outside collateral with data on outside collateral – and that specifically tests theories of inside collateral with data on inside collateral.

5. Technological Innovation and SME Lending

Related to the issue of hardening soft information is the broader issue of the overall impact of technological innovation on SME lending technologies. As noted above the assertion that technological innovation has significantly altered the way financial institutions lend to SMEs is widespread in the literature. But, relatively little evidence has been offered in the academic literature to support this contention. In my opinion much more research is needed to identify exactly how technological innovation has changed SME lending and the extent to which this has been economically significant. Moreover, this research should be focused on precisely how technological innovation has affected the mix of lending technologies (presumably through changing their relative costs) and how they are extruded (i.e., the relative size of the SME lending channels).

Consider first the issue of SBCS. This is often used as an example of technological innovation. There is considerable evidence that SBCS has become an economically important lending technology
(see above). But, there is not much evidence that SBCS had much – if anything – to do with technological innovation. The reason is straightforward. The technology already existed – and had existed back to about 1970 when banks started routinely credit scoring consumer loans (e.g., Jessup 1978). That is, the use of discriminate analysis to assess default prediction had been widely used in consumer credit scoring models for decades. The innovation inherent in the adoption of SBCS was to meld some firm-level variables onto an existing consumer credit scoring model. Moreover, most of the loading in these SBCS models is likely on the consumer (i.e., entrepreneur’s personal) characteristics given that the entrepreneur personally guarantees SBCS loan. While these loans are proprietary (and, thus, invisible to the empiricist) the most important business component is likely to be a business credit bureau rating such as the D&B Paydex score. The D&B Paydex score - or its equivalent - has been sold by D&B for decades prior to the introduction of the SBCS. Thus, it probably makes better sense to classify SBCS as a financial innovation, but not a technological innovation because the technology to introduce SBCS existed in the 1970s. (Of course, better databases exist today due in part to better technology.)

More generally the academic literature seems to be assuming that because banks have been rapidly adopting information technology systems in their overall operations (IT systems that are capable of facilitating sophisticated activities such as asset-liability management, EVA analysis, internet banking, compliance activities, information security risk assessment, and core processing) that they must have likewise been adopting IT at this same rate in their commercial lending activity. However, the academic research has provided little in the way concrete evidence or examples of significant advances in technology related to the production of information in SME lending. For example, it’s not obvious that financial statement lending has changed in significant ways in the last four decades. It’s true that we can now spread financial statements using an Excel spreadsheet instead manually spreading as we did 30 years. But, it’s also true that four decades ago it only took a good junior credit analyst about one hour to spread a set of financial statements with a manual adding machine. The broader point here is that it is incumbent on researchers who claim that technology is fundamentally changing SME loan underwriting to provide more evidence on the nature of this technological innovation and is economic importance.

6. Audited Financial Statements

45 For detail on the Paydex score see Kallberg and Udell (2003).
46 Even business credit scoring goes back to 1968 with the introduction of the Altman Z-score model (Altman 1968).
The SME lending channel paradigm gives considerable weight to the importance of audited financial statements. In great part, the defining line between relationship lending and financial statement lending is the audit. Financial statement lending is not feasible unless the firm’s financial statements are informative and credible. Practically speaking, this means audited. (Even in the other lending technologies financial performance measured by informative financial statements can play an important secondary role.) The academic literature has certainly recognized the importance of accounting and the accounting infrastructure (e.g., La Porta et al., 1998) as a key piece in shaping the way SME financing is conducted within a financial system, i.e., what a country’s SME lending channels look like (Berger and Udell 2006). Moreover, empirical research on SME access to finance will often include a control variable for audited financial statements, data permitting. This has been used in paper on countries spanning Europe, North America and Asia (e.g., Berger et al. 2005, Popov and Udell 2011, Ferrando, Popov and Udell 2015, Uchida, Udell and Yamori 2012).

Missing in the academic literature is a thorough analyses of the audit itself and the decision to obtain an audit. The decision to obtain an audit can be viewed as the decision to invest in becoming a substantially more transparent firm. But, this decision comes at a cost. Audits are expensive. Somewhat surprisingly there is very little research on the benefit/cost trade-off in the choice of whether to get an audit as noted by Carey, Knechel and Tanewski (2013). This lack of research is particularly troubling because the audit decision matters the most in the SME sector. In fact this decision may lie squarely on the cusp between a “small” firm and a medium-sized “firm” – i.e., the in the middle of the SME space. To best of my knowledge there is only one paper that has examined the audit decision in the SME sector: Allee and Yohn (2009). This paper exploited the 2003 SSBF data that was particularly rich with respect to information on the type financial statement and potential firm variables that might drive the choice of obtaining different types of financial statements including the most information, the audit. These data also had information that enabled the authors to examine the benefits from an audit in terms of cost and access to credit. The paper finds among other things that size is an important determinant and that the choice of financial statements matters in terms of access to finance. While this paper has received a reasonable amount of interest in the accounting literature, it appears to be virtually unknown in the finance literature – and, particularly, the literature on SME access to finance. In my view this is one of the most under-researched areas in SME access to finance. While Allee and John (2009) sheds considerable light on how the audit decision is made, data limitations did not allow it

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47 A point also made by Carey, Knechel and Tanewski (2013).
48 By my count of the 109 Google citations garnered by Allee and John (2009), only one has been in an article published in a finance journal that where this author was not a co-author.
to look at the cost side of the benefit/cost trade-off. It is also not clear how applicable the results are outside of the U.S. Given the considerable differences in accounting standards and accounting infrastructure across the globe (including differences between developed and developing economies) there is much more that we don’t know about the benefits versus costs of getting an audit than we do know. More research is definitely called for.

7. Cooperatives

In my view the sector of the global bank system that is least understood is the space in the global financial landscape occupied by cooperative banks. Despite the fact that these institutions are ubiquitous and span the developing and developed world there is surprisingly little research on them. Even in the U.S. cooperatives have played a major role in financial intermediation. Historically the most important cooperative in the U.S. was the mutual savings and loan association (S&L). With the demise of the S&L industry beginning in the 1980s the mantel has shifted in the U.S. to credit unions. Today in the U.S. S&Ls, mutual savings banks and credit unions hold 13.1% of banking assets. Credit unions alone have 10% of household deposit savings. And, like credit unions and cooperatives in many other countries, credit unions in the U.S. make SME loans.

Are cooperatives interesting from an academic perspective? If the answer is “no”, then the paucity of research on cooperatives appears justified. In my view, cooperatives are interesting – as well as economically significant. But “why”? The answer is governance. One essential difference between cooperatives and private banks is their governance. Governance in private banks is relatively straightforward in the sense that stockholders “own” the bank, and in the sense that shareholder wealth maximization is the objective function. We know, of course, that agency problems drive a wedge between ownership and bank behavior. But, there is a considerable body of research on the link among governance, regulation and bank behavior in the private banking segment of the global financial system including most prominently Laeven and Levine (2009).

Now consider the cooperative component of the global banking system. First, “ownership” and control are not as straightforward as in the private banking component. Second, governance is more complicated. Third, the objective function is not so obvious – and, it may be quite different from banks leading to different behavior that may have consequences for SME access to finance. Fourth, there is not much research on this.

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49 Cooperatives can be considered part of the non-traditional component of the global banking system that also includes government-owned banks. Non-traditional bank represents about 40% of the global banking industry (LaPorta, Lopez-de-Silanes and Shleifer 2002).
Let’s start with the objective function. There is a potentially burgeon academic literature where principals and agents are driven by a “higher purpose,” as well as by wealth maximization (e.g., Handy and Katz 1998, Glazer 2004, Delfgaauw and Dur 2007, Hesse and Cihak 2007, Nyborg and Brekke 2010, and Thakor and Quin 2014). While this literature has not focused on cooperatives, it seems applicable to the issue of whether cooperatives behave more altruistically and more ethically than banks. This appears to be a mostly unexploited “research opportunity”. Part of the missing research here is research on exactly how governance works in these institutions. More broadly, missing in the literature is a study that links governance, regulation and bank behavior in the cooperative segment of the banking industry (and how that relates to SME access to finance) as in Laeven and Levine (2009).

There are reasons to believe that cooperatives do, in fact, behave differently consistent with the theoretical literature cited above. For example, there is evidence that credit unions discipline banks in small local markets (Feinberg 2001), evidence that large credit unions appear to be more scale efficient (Wheelock and Wilson 2009), cooperatives may lend to SMEs at more attractive rates than small banks (Angelini, Di Salvo and Ferri 1998), the determinants of credit union failure appear to be different from the determinants of bank failures (Wilcox 2007), and credit cooperatives lend more (Becchetti, Ciciretti and Paolotonio 2014). An interesting example the U.S. related to the issue of whether cooperatives behave more ethically involves the change in overdraft policies that most big banks adopted in the 2001 and 2002. These banks – allegedly without proper public notice – changed the order in which they processed checks from low-to-high (low meaning small check amounts) to high-to-low. This triggered many more checks being classified as NSF (not sufficient funds). That is, because the NSF fees were assessed on a per check basis (typically about $35 per check) this dramatically increased fee revenue. Virtually all of the banks were sued in class action lawsuits and virtually of them have settled for hundreds of millions of dollars. Evidence suggests that credit unions in the U.S. were less likely to change their NSF policies to exploit this strategy (Levitran 2010).

However, the news is not all good in this regard. For example, there is evidence of expense preference behavior among cooperatives (Mester 1989) and evidence that credit unions in the U.S. have become less efficient recently (Wheelock and Wilson 2009). Perhaps more interesting is the implosion of the cajas banks in Spain which pre-crisis represented half of the banking industry in Spain. Recent research indicates that when these cooperative banks were spatially deregulated in the decade before

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50 There certainly has been some interesting research on cooperatives that includes research on the efficiency of cooperatives (e.g., Mester 1992, Altunbas, Evans and Molyneux 2001, Carbo, Gardener and Williams 2002, Wheelock and Wilson 2012).
the crisis, they expanded outside of their historical headquarters and “bottom fed” in their SME lending rather than “cherry picked”. That is, they extended loans to riskier SMEs when they expanded outside their historical market. Moreover, this strategy was related to political capture (Illueca, Norden and Udell 2014).

More research is needed on whether the broad issue of the optimal size of the cooperative banking sector in financial system architecture and on the more specific issue of whether cooperatives are better at some types of lending technologies – and how the cooperative SME lending channels behave during a financial crisis.

8. **Countercyclical Macro-prudential Policy Tools**

This financial crisis has acutely focused policymakers on macro-prudential policies. Much of this attention has centered on countercyclical macro-prudential policy tools (CMPPTs) designed to limit the build-up of systemic risk in the banking system during a bubble period and/or to dampen price increases that lead to this risk accumulation.52 At first blush this interest would seem to have little to do with SME access to finance because most of the CMPPT attention has been focused on the residential mortgage market.53 But, this misleading for two reasons: First, the residential mortgage market matters in the SME market. Second, CMPPTs are not limited to the residential mortgage market.

There are a number of different CMPPTs tools that have received most of the attention: loan-to-value (LTV) caps, debt-to-income (DTI) caps, countercyclical capital buffers and dynamic loan loss provisioning (e.g., IMF 2011). Let’s focus first on the residential mortgage market where most of the attention has been on the first two tools. The idea behind an LTV cap is simple: imposing a ceiling on the LTV ratio in mortgage lending constrains lenders from loosening their standards in the boom period and thus potentially diminishes pro-cyclicality in lending.54 The same logic holds for DTI caps. An IMF survey found relatively widespread use of LTV caps, the most common CMPPT instrument, across the globe (IMF 2011). Moreover, since the financial crisis a number of countries have introduced LTV caps including Canada, South Korea and (most recently) Sweden. However, it has been empirically difficult to assess the effect of LTV caps due to data limitations (IMF 2011).

LTV and DTI caps matter to SME access to finance for two reasons. First, as we noted above entrepreneurs often pledge their personal houses as collateral. A direct effect could come if the LTV cap

52 For a recent review of the literature on CMPPTs see Ono et al. (2015).
53 See Borio and Shim (2007) and Crowe et al. (2011).
54 The academic literature finds evidence of pro-cyclicality in the commercial lending (e.g., Crowe et al. 2011, Berger and Udell 2004).
includes both the residential mortgage and the business loan (to which the house is hypothecated). Of course, this could have the opposite effect if the constraint limits mortgage finance but frees up collateral value for a business loan. In the case where the entrepreneur borrowers personally on the home mortgage and then lends the proceeds to her firm, the LTV cap would constrain this channel also. Second, LTV caps (and DTI caps) could be imposed on commercial property which often secures SME loans as we’ve noted above and a few countries have done this such as Singapore. Moreover, LTV caps could feasibly be imposed on any of the collateral based lending technologies, e.g., LTV caps on inventory lending, LTV caps on equipment lending. One recent study on Japan has specifically looked at the effect of an LTV cap on the real estate-based SME lending channels (Ono et al. 2015). It was widely believed among policymakers and the financial press in Japan that a loosening of credit standards (i.e., an increase LTV ratios at loan origination in business lending) during the bubble period before the Japanese financial crisis was the root cause of the lost decade which began in April 1990 when real estate prices peaked and the bubble burst. (In Japan the real estate SME lending channels were likely the most important in pre-crisis Japan.) This study found, however, that had an unconditional LTV cap been counterfactually imposed, it would not have worked because the LTV ratio was countercyclical, not pro-cyclical.

SMEs can also be affected by the other two CMPPTs mentioned above. In the case of countercyclical capital buffers, such as those in Basel III, there is concern that higher capital requirements could discourage lending in general, and SME lending in particular, as banks adjust their balance sheets. However, it is not obvious whether this effect would obtain in an economically significant way. With respect to the dynamic loan loss provisioning, we have the benefit of a natural experiment in that Spain implemented dynamic loan loss provisioning in the decade prior to the financial crisis. At least two studies have been conducted on Spain’s experience. One study found evidence of a positive effect in that dynamic provisioning dampened the contraction in the supply of credit and its impact on the real economy once the crisis started (Jimenez et al. 2013) but the other study found that prior to the crisis the implementation dynamic provision caused some banks to increase their appetite for lending to riskier SMEs (Illueca, Norden and Udell 2015).

Because interest in CMPPTs is so recent, there is very little research on the potential impact of these tools on SME access to finance. Future research will be important in this area as policymakers consider the extent to which, and the nature of, the CMPPTs they may implement going forward.

9. Government Guarantees
Government guarantees of SME loans are one of the two credit multipliers mentioned earlier in Section III.C. Government guarantee programs are on my top-ten list because relative to the widespread adoption of these programs and the acute policy attention they garner, there is a significant shortage of literature. I am sure that my experience mirrors that of other researchers who have worked on the topic of SME access to finance – and, my experience has been that policymakers have a keen interest in asking us about government guarantee programs. Not surprisingly countries around the world have injected considerable funding into these schemes (e.g., Cressy 2000, 2002). There is general consensus on the motivation for such programs: 1) market imperfections lead to a funding gap in the SME market that loan guarantees can fill; and, 2) public sector involvement can spur innovation where it matters most, the SME sector (e.g., Hancock, Peek and Wilcox 2007). The unsettled issue is whether these programs are, on balance, welfare improving. The biggest downside to public guarantee funds is associated with the adverse selection and moral hazard problems they may engender. Some researchers have cautioned that government guarantee programs ultimately reduce social welfare suggesting that credit decisions may best be left to the private sector (De Marco 2002). However, my sense of the literature in this area is that on balance the research has suggested the presence of positive net benefits including increasing real economic activity (e.g., Craig, Jackson and Thomson 2005, Hancock, Peek and Wilcox 2007), decreasing the pro-cyclicality of SME lending (e.g., Hancock, Peek and Wilcox 2007) and mitigating the effects of macro shocks (e.g., Uesugi, Sakai and Yamashiro 2006, Wilcox and Yasuda 2010). My sense is that more research is needed on several key dimensions. First, research is need on which type of government guarantee schemes work best and, in what type of environments. Second, we need more research on how well government guarantee schemes work in acute financial crises, particularly this crisis. Third, we need a better methodology for gauging the efficiency gains (losses) from government guarantee schemes. For example, are short term benefits in terms of real activity the correct measures?  

10. SME Loan Securitization

Securitization is the second credit multiplier mentioned above. The birth of securitization occurred in the U.S. in 1968 when GNMA offered the first mortgage backed security (MBS), the GNMA pass-through. The securitization of the residential mortgage market rapidly expanded from its initial focus on underlying mortgages with government guarantees to ultimately subprime MBS. Securitization

55 For a brief discussion of the some limitations associated with analyzing research on the U.S. Small Business Administration loan guarantee program see the conclusion in (Craig, Jackson and Thomson 2005).
also expanded into other markets including among others commercial real estate, auto loans, accounts receivable, music industry royalties and beyond. It is not surprising that beginning in the 1980s there was considerable practitioner and policymaker interest in securitizing commercial loans and particularly SME loans. And there now appears to be a resurgence of policy interest in SME loan securitization particularly in Europe. No doubt some of this resurgence is driven by the recent credit crunch in the SME sector. Policymakers argue that there are a number of benefits to a well-functioning SME securitization market including: a bank funding tool; an alternative to bank funding; bank portfolio diversification; liquidity; macro-prudential benefits from transferring risk away from the banking sector (e.g., BoE-ECB 2014). Policymakers in Europe have actively promoted expanding the SME securitization market including the November 2014 ECB introduction of its Asset-backed Securities Purchase Program (ECB 2014).

SME securitization in Europe today represents about 10% of total outstandings in the European securitization market - quite large relative to the U.S. (Altomonte and Bussoli 2014). There is a large variation, however, across countries with Spain and the Netherlands and quite of few countries with little or none (see Table 1). The volume of SME asset-backed security (ABS) issuance has significantly declined since the crisis and the secondary market is moribund. More interestingly nearly all (90%) of the current SME ABS are retained on the balance sheets of the issuing banks (i.e., it does not trade) which is usable as collateral posted with the central bank. This raises a question as to the extent to which the European SME ABS market endogenously emerged as a private market. This also depends on the extent to which SME ABS issuance was fueled by government support programs in big issuers like Spain and the extent to which the types of loans span the spectrum of SME lending. Relevant here is the issue of which types of SME loans are securitized.

SME securitization in the U.S. has also had an interesting history. There was much speculation in the late 1980s and early 1990s about a rapid growth in this market with some pundits claiming that securitization would ultimately become the primary source of SME funding. Since then the reality has been quite different. Securitization of SME loans in the U.S. is virtually entirely limited to the federal government’s Small Business Administration (SBA) loans, particularly the SBA’s 7(a) guarantee program (Berger and Frame 2005). SBA loans appear to be attractive instruments substantially (if not solely) because of the government guarantee associated with underlying asset and the standardization of this loans by SBA policy (Wilcox 2011). “Indirect” securitization, however, may be far more important. This occurs when an entrepreneur’s mortgage, vehicle loan or credit card loan is securitized -- and the proceeds from these loans are used to provide financing for the entrepreneur’s business. It is very
difficult to estimate the economic importance of this type of indirect securitization although one estimate indicates that it could be as high as 20% of SME debt in the U.S. (Wilcox 2011).\textsuperscript{56} 

Taken together the European and U.S. experience suggests that there may be significant limitations to securitization as a credit multiplier and a solution to the SME funding gap. To the extent that SME loans are tailored financial contracts that require renegotiation flexibility, securitization may be of limited value in increasing SME access to finance.\textsuperscript{57} For example, it may be feasible in small generic amortizing loans but not feasible in more complex large loans used for working capital purposes (i.e., lines of credit and overdraft facilities). More research is certainly called for in this regard particularly given the resurgence of interest in promoting SME loan securitization.

\section*{V. Conclusion}

This paper attempts to assess the status of the current academic literature and on SME access to finance. The last comprehensive assessment was Berger and Udell (1998). Much has happened in the intervening years in terms of research on this topic. If anything the topic has become of more interest to academics because it has become a more important policy issue. Heightened policy interest has in great part been driven by the acute credit crunch associated with recent financial crisis.

The intent is to assess what we have learned about SME finance, and to identify fruitful areas for future research. This exercise is conducted through window of two paradigms: the lending technology paradigm suggested in Berger and Udell (2006) and the SME lending channel paradigm suggested in Taketa and Udell (2007). One caveat is in order. This literature has grown so rapidly that it is not possible to include all of the papers that have contributed to this field, much discuss each one individually. The goal here is more modest: to provide sense of where the frontier of research lies today and where it might best go in the future.

\textsuperscript{56} “SME debt” in this context includes the entrepreneur’s personal debt used to finance her firm.

\textsuperscript{57} Renegotiation clearly became an immense problem in the U.S. with respect to securitized subprime mortgages. Not only was the underestimation of the probability of default on subprime MBS, but this likely also blinded practitioners and policymakers to the need establishing a renegotiation infrastructure in the event of a real estate downturn.
References


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Figures

Figure 1
Lending Technologies

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Figure 2
Japanese SME Lending Channels: Pre-Crisis (1990)

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Figure 3
U.S. SME Lending Channels (2015)

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### Figure 4

**U.S. SME Lending Channels - 1990-92 Credit Crunch**

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### Figure 5

**U.S. SME Lending Channels - The Recent Financial Crisis**

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### Figure 6

**Croatian SME Lending Channels - The Recent Financial Crisis**

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Figure 7

Fraction Foreign Bank Ownership (2008)
Table 1
Total Outstanding Amount of EU Securitized Products

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<th></th>
<th>ABS</th>
<th>CDO</th>
<th>CMBS</th>
<th>RMBS</th>
<th>SME</th>
<th>WBS</th>
<th>Total</th>
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<td>1.7</td>
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<td>9.5</td>
<td>14.8</td>
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<td>1006.1</td>
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</table>

Source: SIFMA data 01-2014.

From: Altomonte and Bussoli (2014)