

# SME Access to Intermediated Credit: What Do We Know and What Don't We Know?

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## 1. Introduction

Over the past several decades, there has been a growing interest in small to medium-sized enterprise (SME) finance among academics. In great part, scholarly interest in SME finance was a natural outgrowth of the early information-based theories of banking (Diamond 1984; Ramakrishnan and Thakor 1984; Boyd and Prescott 1986). This 'modern theory of banking' argues that banks are uniquely suited to produce information about opaque borrowers, of which SMEs are a prime example. This theory, therefore, helped fuel academic interest in SME finance because it implicitly pointed out that the best place to look for the effect of asymmetric information on financial contracting is likely to be in the SME sector.

The interest in SME finance has, however, not just been from academics studying banking but also from corporate finance academics. The literature on corporate finance focuses on how firms access external finance (Jensen and Meckling 1976; Townsend 1979; Myers 1984; Myers and Majluf 1984) – and in the SME sector this usually means bank loans.<sup>1</sup> So while the banking literature focuses on SME external finance from the lender's perspective, the academic literature on corporate finance focuses on SME external finance from the firm's perspective. Thus, in the SME space at least, these are quite clearly two sides of the same coin.

I, among others, have written a number of overview papers on SME finance – both on the broad topic of SME finance (Berger and Udell 1998) and on special issues within the general topic of SME finance (Berger and Udell 2002, 2006; Taketa and Udell 2007; Udell 2009, 2011). Since the time of these reviews, however, there have been a number of important developments.

- There is heightened public policy interest in the topic. Policymakers are naturally concerned about SMEs because they are such a large component of the global economy. Even in countries such as the United States – which is viewed as a decidedly market-oriented economy – the SME sector is huge. About half of the labour force in the United States is employed by firms with fewer than 500 employees (Stangler and Litan 2009). However, policymakers' 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 factors such as: the vulnerability of SMEs because of their opacity; the potential effect of financial reforms on SME access to finance (e.g. the potential effect of risk-based capital); significant structural changes in the banking industry

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<sup>1</sup> There are, nevertheless, other important sources of external finance, the most important of which is trade credit (Berger and Udell 1998).

(e.g. consolidation and deregulation); and the impact of macroeconomic shocks. Probably more so than ever, policymakers are turning to the academic community for answers to questions about SME finance.

- The literature has reached a point where we can start drawing much stronger conclusions about what we know about SME finance. In particular, new datasets have driven a surge of empirical investigation of theoretical models of SME access to finance. These include firm-level survey data in Japan collected by the Research Institute of Economy, Trade and Industry (Uchida, Udell and Yamori 2012) and loan-level data collected by the Central Bank of Ireland as part of the Financial Measures Programme 2011 (McCann and McIndoe-Calder 2012). It also includes new cross-country survey data such as the European Bank for Reconstruction and Development (EBRD) and World Bank's Business Environment and Enterprise Performance Survey (Popov and Udell 2012) and the European Central Bank (ECB) and European Commission's firm-level Survey on the Access to Finance of Enterprises (SAFE) (Ferrando and Mulier 2013). As a result, academic work on SME access to finance has progressed significantly since the last comprehensive assessment in 1998 (Berger and Udell 1998). A striking example of the seasoned nature of this research is the new meta-analysis by Kysucky and Norden (2014) on relationship lending.

The global financial crisis – arguably the biggest macro shock in nearly a century – has fuelled enormous interest in SME finance and has generated a large increase in research on the topic. Thus, it seems prime time to review how the literature has evolved and conduct an assessment of what we know and don't know about SME finance. This paper – as the title suggests – attempts to do this. Clearly in an overview piece such as this it will be impossible to discuss in detail all of the relevant papers. 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.

To structure 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 facilitate a discussion of what the extant literature tells us about SME access to finance and help identify the biggest holes in the literature. In the interest of time, I will only consider the debt side of SME finance.<sup>2</sup>

In Section 2, I present the concept of lending technologies and use it as a vehicle to discuss the literature on SME debt finance. In Section 3, I present the concept of SME lending channels and use it to discuss several of the remaining topics that fall under SME finance, specifically organisational issues associated with providing SME loans and how SME finance can be affected by macro shocks. Prominent examples of the latter are the early 1990s banking crisis in Japan and the financial crisis in the United States and Europe. Everyone seems to like a 'top 10' list. In that spirit, Section 4 offers what I see as the 10 biggest gaps – and best research opportunities – in the SME finance literature. Section 5 concludes.

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<sup>2</sup> 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 crowdfunding. 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.

## 2. Lending Technologies

### 2.1 An introduction to the lending technologies framework

A lending technology is 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, p 2948). The concept of 'lending technologies' was first introduced to the academic literature in Berger and Udell (2002). Its introduction was motivated by a desire to more closely connect scholarly work on SME finance to commercial lending as practised in the real world.

The early academic research on banking and commercial lending was generally quite abstract. In that literature, distinctions were made between arms-length finance and informed lenders – that is, corporate bonds versus commercial loans (Rajan 1992). Similarly, the empirical literature focused on the fact that banks are unique in their role as a delegated monitor (James 1987). While granular examination of how banks actually underwrote commercial loans can best be traced to the early papers on relationship lending (Petersen and Rajan 1994, 1995; Berger and Udell 1995), at the risk of some oversimplification, the academic literature became too focused on relationship lending. 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 banks extended credit – particularly in the SME market – was through relationship lending. The principal contribution of Berger and Udell (2002) was, therefore, to highlight the reality that both large and small banks lend to SMEs in many ways that deviate from pure relationship lending.

Berger and Udell (2002) and subsequent refinements emphasised that banks lend to SMEs using a variety of different lending technologies (Berger and Udell 2006; Berger 2015). These lending technologies are not necessarily available in all countries; availability depends on a country's financial institutional structure and its lending infrastructure (Berger and Udell 2006). Big distinctions likely exist between developed and developing economies, and even among developed economies.

#### 2.1.1 The lending technologies

Table 1 lists the 10 lending technologies that exist in at least some countries today.<sup>3</sup> 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 the type of lending but emphasises the primary source information on which the technology is based – whether it is 'soft' information or 'hard' information. Soft information is information that is not quantifiable and not easily transmitted within the hierarchy of a financial institution (Stein 2002). Hard information is quantifiable and can be transmitted – such as audited financial statements.

<sup>3</sup> A more extensive definition and discussion of most of these lending technologies can be found in Berger and Udell (2006) and Berger (2015).

**Table 1: Lending Technologies**

Technology	Type	Borrower	Information
Relationship lending	Relationship	Opaque	Soft
Financial statement lending	Transaction	Transparent	Hard
Asset-based lending/ discounting	Transaction	Opaque	Hard
Factoring	Transaction	Opaque	Hard
Equipment lending	Transaction	Opaque and transparent	Hard
Leasing	Transaction	Opaque and transparent	Hard
Real estate-based lending	Transaction	Opaque and transparent	Hard
Small businesses credit scoring	Transaction	Opaque	Hard
Crowdfunding	Transaction	Opaque	Hard
Trade credit	Transaction and relationship	Opaque and transparent	Soft and hard

One interesting aspect of Table 1 is that columns 3 and 4 do not necessarily line up in ways implied by the early literature on banking and lending. As 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. But Table 1 emphasises that many hard information (and transactions-based) lending technologies are used to lend to relatively opaque SMEs. Each technology is described in more detail below.

1. *Relationship lending.* In relationship lending, lenders collect soft information about the borrower over time and across different products and use this information in underwriting the loan and monitoring the borrower.<sup>4</sup> Relationship lending is often the lending technology of choice when other lending technologies are not available (i.e. when audited statements and collateral are unavailable and trade credit access has been exhausted).
2. *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. When these ratios are weak – and therefore signal high risk – SMEs are likely to obtain external finance through one of the other transactions-based (hard information) lending technologies.

<sup>4</sup> Berger (2015) makes a distinction between 'judgement lending' and 'relationship lending'. Both are based on soft information lending. Judgement lending refers to soft information lending early in (including the beginning of) a banking relationship before much soft information has been accumulated over time and over multiple banking products. In this paper, the two are collapsed into a single lending technology, recognising that early in a relationship the accumulation of soft information is less than later in a relationship.

3. *Asset-based lending.* Asset-based lending – 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 can be pledged as collateral. This lending technology is typically used for working capital purposes. The amount of the loan is determined by a loan-to-valuation (LTV) ratio applied to accounts receivable and inventory, which is calculated on a daily basis. The LTV ratio is calculated based on 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 equipment lending (Udell 2004).
4. *Factoring.* In factoring, the lender – known as the 'factor' – purchases accounts receivable from the borrower. The amount advanced (the analogue of the LTV ratio) to the borrower against accounts receivable is typically calculated using the same basic quantitative metrics as in asset-based lending. However, unlike asset-based lending the ownership of the accounts receivable passes from the borrower to the factor (Udell 2004).
5. *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 the amortisation of the loan is typically 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 amortisation is set based on the remaining life span of the equipment. For many loans, particularly in developed economies, professional appraisers are hired to evaluate the equipment (Udell 2004).<sup>5</sup>
6. *Leasing.* Leasing is similar to equipment lending except that the 'lender' (the lessor) owns the equipment rather than the 'borrower' (the lessee).
7. *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 lending for other purposes but underwriting the loan based on the value of the real estate. The real estate can be either commercial property owned by the SME or entrepreneur, or residential property owned by the entrepreneur. Real estate lending is typically based on an independent appraisal of the real estate.
8. *Small business credit scoring.* This is a relatively new lending technology in which the loan is primarily or exclusively assessed 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 minimal or no human interaction. Banks use this technology for smaller loans typically under \$250 000, or in many cases under \$100 000.
9. *Crowdfunding.* 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 SME or entrepreneur on an unsecured basis.

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5 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 (Udell 2004).

10. *Trade credit*. This is credit extended by vendors to purchase raw materials. It appears as accounts payable on the borrower's balance sheet and as 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.

A discussion of these lending technologies serves two purposes: it provides a conceptual framework for thinking about SME finance on many dimensions; and it provides a convenient way to discuss the frontier of academic literature on SME finance. Section 2.2.1 looks at the literature on each separate lending technology. 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 – loans used for the purpose of buying another company. Some 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 – they are used to finance accounts receivable and 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.<sup>6</sup> However, all of the other lending technologies could be used for working capital purposes or fixed asset purchases. For example, lending against existing equipment can provide funds for working capital purposes. And many of these lending technologies can be used for acquisition financing (e.g. asset-based loans).

Second, different lending technologies can be used for different loans to the same firm. 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 to the same firm for the purpose of purchasing a piece of equipment. Further, equipment may be pledged as a secondary source of collateral for an existing asset-based loan.

Third, these lending technologies are not mutually exclusive, even at the loan level. Some aspects of one lending technology may be used as a secondary underwriting tool in conjunction with the primary lending technology. For example, there may be a relationship aspect to a financial statement loan; banks often 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. In other words, a lending technology relates to how a loan is *primarily* underwritten and monitored.

Fourth, lending technologies can interact with 'credit multipliers'. Two credit multipliers have received considerable policy attention recently. First, many countries have government guarantee programs where government guarantees partially indemnify loans made in the private sector.

<sup>6</sup> 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.

Second, in many developed economies some SME loans have been securitised. These credit multipliers have been introduced based on the assumption of a temporary or permanent funding gap in the SME sector (see also Section 3.3).

## 2.2 Lending technologies and the academic literature

In discussing the literature on SME lending through the prism of lending technologies, it will be helpful to decompose the discussion into two parts: the individual lending technologies (Section 2.2.1); and the lending environment (i.e. policies and infrastructure) that affects the existence and importance of each of the lending technologies across the globe (Section 2.2.2). Section 2.2.3 concludes the discussion of lending technologies with some broad thoughts on the usefulness of the lending technologies paradigm.

### 2.2.1 The literature on individual lending technologies

For expositional purposes it will be helpful to break the 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 implies a powerful common link among the collateral-based lending technologies. Although all of the collateral-based lending technologies involve lending against the value of a tangible asset, 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, the 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.

#### 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. This seemingly suggests that proportionately more space in this paper should be devoted to relationship lending because there is so much written about it. But, as it turns out, it is the only lending technology on which the advantage of a meta-analysis – specifically, the cross-country meta-analysis on relationship lending by Kysucky and Norden (2014) – is available. The large literature on relationship lending makes such a study feasible. By exploiting this analysis of 101 separate studies, relationship lending can most efficiently be covered by simply summarising the key findings. I will also offer a few additional comments on relationship lending.

As noted above, in deploying this technology, lenders collect soft information about the borrower/entrepreneur over time and use this information in underwriting the loan and monitoring the borrower. Probably the most critical issue is whether relationship lending indeed reduces information asymmetries through the production of soft information. In other words: does relationship lending work? Does it produce benefits to the borrower?

By definition, soft information is not quantifiable and easily transmitted within the hierarchy of lending organisations. This makes it unobservable to the empiricist. Thus, from the beginning of the literature on relationship lending, researchers have sought proxies for the production of soft information, most of which are related to the strength of the relationship (Petersen and Rajan 1994, 1995; Berger and Udell 1995). These proxies include relationship length, bank-borrower distance, exclusivity and cross-product information synergies.<sup>7</sup>

The Kysucky and Norden analysis indicates that strong relationships tend to benefit SMEs in terms of lending outcomes:

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 a higher prevalence of relationship lending does not necessarily come along with higher benefits for borrowers. (Kysucky and Norden 2014, p 1)

Importantly, however, Kysucky and Norden note that 'lending outcomes differ across the relationships' dimensions' (Kysucky and Norden 2014, p 1).

Kysucky and Norden's finding on competition is interesting because theoretical models of relationship lending suggest that in order to induce a bank to invest in a relationship, the bank needs some market power to ensure that its investment has a positive net present value (Petersen and Rajan 1995). This implies a 'hold-up problem', where relationship-dependent SMEs become captured by their relationship lenders. Thus, there is a tension between the benefits of competition (more competition diminishes the hold-up problem and improves pricing to the SME) and the benefits of market power (encouraging more relationship lending). Kysucky and Norden's finding implies that competition wins this horse race. However, this finding might be sensitive to how competition is measured – for example, whether it is measured using the Lerner Index or by concentration measures such as the Herfindahl-Hirschman Index (Carbó-Valverde, Rodríguez-Fernández and Udell 2009).

The existence of a hold-up problem also suggests that a firm's life-cycle effect – where a firm grows from being a small and acutely opaque firm to a larger informationally transparent firm – matters for its access to finance (Berger and Udell 1998). As firms evolve, we should see a tipping point where growing SMEs break the shackles of their relationship loan – that is, break the hold-up problem. At this point, firms would 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 this proposition is that we do not have datasets that span the life cycle. We have a number of datasets on small business finance and we have extensive data on large firm finance, but none span small, medium and large firms. Nonetheless, one study finds evidence of this tipping point in the firm life cycle using US data on firms that range from (smaller) mid-sized firms to very large firms (Gopalan, Udell and Yerramilli 2011). That is, firms outgrow their relationship bank and switch to a transactions-based bank. Once they transfer they obtain more funding and enjoy an improved growth trajectory.<sup>8</sup>

<sup>7</sup> In addition to the Kysucky and Norden (2014) meta-analysis, there have been several papers exclusively devoted to a review and assessment of the literature on relationship lending (see, for example, Boot (2000) and Elyasiani and Goldberg (2004)) and other papers that included a comprehensive discussion of this literature (Berger and Udell 1998, 2002, 2006).

<sup>8</sup> 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.



Kysucky and Norden (2014) may understate the benefits from relationship lending, as defined in *this* paper. In most of the studies surveyed by Kysucky and Norden, 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 relationship is less important than the hard information used in the primary lending technology. This suggests a bias against finding relationship benefits. Thus, Kysucky and Norden's finding of relationship benefits is a particularly powerful result.

*Financial statement lending.* Relatively little has been written about this transactions-based lending technology for SMEs. 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 medium-sized and large firms.

As defined here (and in Berger and Udell (2006)), financial statement lending is based on audited financial statements – that is, financial statements that are informative because 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 applies 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 use of covenants and the importance of the renegotiation option associated with covenant tightness. Covenants are, for the most part, not feasible in the absence of audited financial statements. The power and usefulness of covenants based on financial ratios (or other financial events) depends on the accuracy of the financial numbers. Covenants written on company-prepared statements or unaudited statements are far less powerful because the information used to enforce them is less reliable. Thus, to understand SME financial statement lending we can turn to an extensive literature on covenants, including early theoretical literature (Berlin and Loeys 1988; Berlin and Mester 1992). Moreover, we can rely on more recent empirical work on covenants even though the data used in this work is mostly on large firms (Chava and Roberts 2008; Drucker and Puri 2009; Gârleanu and Zwiebel 2009; Billett *et al* forthcoming).

The Securities and Exchange Commission (SEC) requires companies that list their securities publicly to periodically submit audited financial statements.<sup>9</sup> These requirements are for large firms or larger mid-sized firms. But for most SMEs, the decision to obtain an audit is a choice. That choice depends on the trade-off between the costs and benefits from getting an audit. The benefits stem from the lower cost for the lender of underwriting the loan using the financial statement lending technology and the potentially better precision in assessing risk. This could, in turn, lead to greater access to credit and a lower price of credit.<sup>10</sup>

This observation raises an interesting question: which SMEs choose to obtain an audit by an accounting firm or certified public accountant? A relatively recent paper by Allee and Yohn (2009) addresses this question. Allee and Yohn examined the decision by SMEs to choose among four

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9 For more detail on the SEC's requirements, see <<http://www.sec.gov/investor/pubs/aboutauditors.htm>>.

10 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.

levels of auditor association: an audit; a review; a compilation; and company-prepared statements.<sup>11</sup> They did so using data on financial statement types from the 2003 Survey of Small Business Finances conducted by the Federal Reserve Board and an ordered probit framework. Among other things, the paper finds that the demand for 'sophisticated' financial statements is positively related to firm size and firm growth. They also find that getting an audit improves an SME's access to credit, in terms of reducing the probability of loan denial. However, they did not find a statistically significant effect on loan rates.<sup>12</sup>

*Small business credit scoring.* Small business credit scoring was adopted in the mid 1990s by Wells Fargo Bank. It quickly spread among large banks in the United States and then to regional US banks and other countries. There has been a considerable amount of interest in the adoption of this transactions-based innovation and on how banks have deployed it. In particular, the literature has focused on its positive effect on: out-of-market lending; longer-distance lending; and overall access to credit (Frame, Srinivasan and Woolsey 2001; Frame, Padhi and Woosley 2004; Cowan and Cowan 2006; DeYoung *et al* 2008; DeYoung *et al* 2011). Somewhat unclear in the literature is the extent to which the benefit from lower underwriting costs is offset by the reduced accuracy of the credit decision (DeYoung *et al* 2008).

Another interesting issue is the nature of the innovation itself. The introduction of small business credit scoring is often described in terms of technological progress and banks taking advantage of 'improvements in information processing, telecommunications, and financial technologies' (Berger 2015, p 303). However, the technology underlying small business credit scoring had existed for many years in consumer loans. I discuss this further in Section 4.5.

*Crowdfunding.* This is a relatively new transactions-based technology (about 10 years old) that has generated a lot of interest in the financial and popular press. Some crowdfunding is on the debt side and some is on the equity side. On the debt side, these are 'microloans' (less than \$25 000) extended on an unsecured basis by individuals to individuals (i.e. P2P lending with the entrepreneur as the obligor). 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 obtained either through a *closed* auction – at the requested amount and rate – or an *open* auction where bidding remains open for a specified period and the rate can be bid down.<sup>13</sup>

There is a small but growing body of literature on this technology that includes:

- investigations of lending biases (Ravina 2008; Pope and Sydnor 2011)
- the role of friendships in mitigating adverse selection and information asymmetry (Lin *et al* 2013)

11 To qualify under the definition of financial statements used in this paper, the statements must be either *audited or reviewed*. In constructing audited financial statements all of the balance sheet and income statement numbers must be verified; in a review at least some of them are (and these are specified in the review).

12 Allee and Yohn (2009) did find evidence of a statistically significant effect on interest rates for SMEs organised as unlimited liability firms (e.g. sole proprietorships and partnerships). However, they cannot specifically analyse the trade-off between audit costs and benefits because the Survey of Small Business Finances does not have data on audit cost (see Allee and Yohn (2009, p 15, footnote 11)).

13 Lin, Prabhala and Viswanathan (2013) provide details on Prosper.com's procedures (Propser.com is the largest peer-to-peer lending market).

- the presence of default information in excess of the hard information associated with the listing (Iyer *et al* 2013).

It is difficult to assess how prevalent this lending technology is. It certainly exists in developed economies like Australia and the United States. However, reliable data on the volume of funding that flows through P2P lending portals are rare. A recent academic paper that used data on '[t]he biggest market, Prosper.com' states that 'Prosper.com has logged over 200,000 listings seeking \$1 billion in funding since its inception'. Moreover, it had, '[b]y the end of 2008 ... over \$178 million in funded loans' (Lin *et al* 2013).

*Trade credit.* Trade credit is the second most important source of external SME debt finance (Demirgüç-Kunt and Maksimovic 2001). Berger and Udell (1998) show that in the United States, trade credit provides 31 per cent of debt financing to SMEs, nearly as much as commercial banks (37 per cent). It is also globally ubiquitous. For example, trade credit provides about 33 per cent of SME debt finance in Spain and about 24 per cent 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.<sup>14</sup>

A variety of theories have been offered to explain trade credit, including: advantages in assessing customer quality; enforcing unsecured debt; signalling product quality; and relationship-based theories. It is difficult to classify trade credit as either distinctly relationship-based or transactions-based because the literature is unsettled on how important the relationship element is.

There is also an extensive literature on whether trade credit is a substitute or a complement to bank loans.<sup>15</sup>

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.

Second, it is my sense that there is some confusion in the literature about 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 cost difference to identify credit-constrained firms.

The assertion that trade credit is extremely expensive appears early in the trade credit literature. Smith (1987) notes that sellers' payment terms can include a discount for early payment. Smith cites the example of '2/10 net 30' contract terms – where buyers have 30 days to pay the invoice and receive a 2 per cent discount if they pay within 10 days. Smith notes that this implies that the interest rate is effectively 44 per cent per annum (Smith 1987, p 865). Smith offers no citation for this description of the payment terms nor any information on how these terms might vary. Petersen and Rajan (1994) also noted the 44 per cent per annum example in order to motivate their identification strategy, and cite Smith (1987) as the source. While Petersen and Rajan (1994)

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<sup>14</sup> For recent discussions of the literature on trade credit, including the theories that potentially explain the importance and advantage of trade credit, see Giannetti, Burkart and Ellingsen (2011), Uchida, Udell and Watanabe (2013) and Carbó-Valverde, Rodríguez-Fernández and Udell (forthcoming).

<sup>15</sup> See, for example, Giannetti *et al* (2011), Uchida *et al* (2013) and Carbó-Valverde *et al* (forthcoming).

qualify their assumption by noting that the rate is clearly lower if borrowers are allowed to stretch their payments, they also note that ‘discount terms are not specific to a firm, but common practice throughout an industry ... [and] discounts and penalties are substantial’ (p 23).

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 – 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 *et al* 2011). Second, as acknowledged by Petersen and Rajan (1994), the stated terms are not necessarily the enforced terms. Third, the ‘all-in’ price – that which matters – must incorporate both the price of the *product* as well as the financial terms of trade credit. It is highly unlikely that there are any available data that would allow us to calculate this all-in price.<sup>16</sup>

If trade credit is much less expensive than implied in the literature, how damaging is this to the extant academic literature? My view is that it depends. The empirical literature, which examines differences in trade credit and bank credit across firms or in response to external shocks, depends 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, trade credit begins to get more expensive than bank loans under normal conditions is probably reasonable. 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 valve during the financial crisis, are likely on safe ground (Garcia-Appendini and Montoriol-Garriga 2013; Carbó-Valverde *et al* forthcoming).

More problematic is interpreting the costs associated with trade credit and what those costs tell us about the uniqueness of trade credit as a lending technology. If the cost of trade credit is indeed 44 per cent, then either trade credit is an exorbitantly expensive lending technology to deliver, or vendors are enjoying extraordinarily high rents; neither seems particularly plausible.

### Collateral-based lending technologies

The remaining lending technologies are based on quantitative hard information about tangible assets. Most of the technologies specifically involve a security interest in the underlying assets (factoring and leasing being the two exceptions). Because hard information about the underlying tangible asset is common to all of these lending technologies, grouping them together makes some sense. In addition, 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 are not owned by the SME (i.e. ‘outside’ the firm). This is quite common in SME lending and occurs most often when an entrepreneur pledges personal real estate as collateral. Inside collateral refers to business assets such as accounts receivable, inventory, and plant and equipment owned by the firm. There is considerable confusion in both the theoretical and empirical literature about these two types of collateral. I’ll defer discussion of that confusion until Section 4.4.

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<sup>16</sup> For a more detailed treatment of this trade credit pricing puzzle, see Miwa and Ramseyer (2008).

*Asset-based lending.* Asset-based lending strictly involves inside collateral (i.e. accounts receivable and inventory). It is targeted to relatively high-risk, high-leverage SMEs that have accounts receivable and inventory to pledge as collateral. The LTV ratio is applied to the collateral on a daily basis, based on changes in the levels of the accounts receivable and inventory. The LTV ratio is calculated based on quantitative formulas that rely on the quality and nature of the collateral (as applicable).

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. As such, this is a relatively expensive lending technology. It is often used in conjunction with SME leveraged buyouts and for distressed firms with a high probability of restructuring. In the United States, it is typical that an asset-based lender will convert to the debtor-in-possession lender who provides the firm with working capital if it goes into Chapter 11 bankruptcy.<sup>17</sup>

Despite the prevalence of asset-based lending in common law countries (e.g. Australia, Canada, New Zealand, the United Kingdom and the United States) there has been relatively little research on this lending technology. Interesting exceptions are Carey, Post and Sharpe (1998) and Klapper (2001), who both provide evidence confirming that asset-based loans are riskier. Mester, Nakamura and Renault (2007) find that the asset-based lending technology improves monitoring and reduces diversion of funds.

*Equipment lending.* Equipment lending is similar to asset-based lending, except that the collateral is equipment owned by the firm. This is, in the vast majority of cases, inside collateral. The loan is either used to purchase the equipment that is used as collateral or it is used for some other purpose. 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 earlier on inside collateral applies directly to equipment lending. However, it is unusual in SME research to find data that is sufficiently granular to distinguish among different types of collateral in empirical studies. Exceptions to this include the Federal Reserve Board's Survey of Small Business Finances (Berger and Black 2011).

*Real estate-based lending.* Real estate-based lending can involve both inside and outside collateral. In the context of inside collateral, real estate-based lending is often associated with financing the SME's headquarters or factory. Perhaps even more important is where real estate-based lending involves outside collateral. This occurs when the entrepreneur pledges their house (or other personally owned real estate) as collateral (typically a second mortgage) that secures a loan to the business.<sup>18</sup>

Recent research suggests that personal real estate can be a significant and important component of SME financing (Ono *et al* 2015). The recent boom and bust in the US housing market has also heightened interest in this type of financing and its link to small business activity. During the boom period – when housing prices increased significantly – this type of lending accounted for

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<sup>17</sup> See Udell (2004) for more details on how asset-based loans are structured.

<sup>18</sup> Alternatively, the entrepreneur could privately obtain a second (private) mortgage or draw down on a home equity line of credit and lend the proceeds to their firm.

as much as 10–25 per cent of the increase in pre-crisis employment in the United States and led to a significant increase in the number of start-ups (Adelino, Schoar and Severino 2013).

The subsequent crisis had equally powerful effects in the opposite direction. One study found that, in the United Kingdom, the average small business extracted 20 cents out of every dollar of increase in the value of real estate during the boom. As a result, the decline in real estate-based small business lending during the financial crisis was responsible for a 10 per cent of the drop in national employment (Kleiner 2015b). Evidence from the United States indicates that one-quarter of large start-ups (defined as \$100 000 in initial financing) relied on home equity as a source of capital, and that house price growth tends to shift financing from formal business loans to home equity financing (Kleiner 2015a). Evidence from Australia also supports the existence of a housing collateral channel affecting entrepreneurial activity, although the effect is relatively small (Connolly, La Cava and Read this volume).

*Factoring.* Factoring shares many similarities with asset-based lending that uses accounts receivable as collateral. The key distinguishing feature is that the lender (called the ‘factor’ in this context) purchases the receivables instead of lending against the receivables as collateral. Factoring can either be conducted on a recourse or non-recourse basis. The former is 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 *et al* 2004). Theoretical work suggests the possibility that factors may have a superior monitoring technology compared with that of suppliers (Sopranzetti 1998). Factors may have an advantage in assessing risk at the underwriting stage because of the economies of scale that arise from constructing large databases on payment performance. Research indicates that, because the ownership of factored receivables is shifted 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 that have weak commercial laws and enforcement, where it is difficult to lend against accounts receivable as collateral (Klapper 2006).<sup>19</sup>

*Leasing.* Leasing is similar to equipment lending except that the ‘lender’ (the lessor) owns the equipment rather than the ‘borrower’ (the lessee). Like factoring, the underlying asset is owned by the ‘lender’. The academic literature on leasing has shown that it can mitigate the adverse selection problems associated with the sale of used and new equipment (Chemmanur and Yan 2000; Hendel and Lizzeri 2002; Gilligan 2004). Leasing may also be motivated by tax benefits (Graham, Lemmon and Shallheim 1998).

### 2.2.2 Lending technologies and the lending infrastructure

Berger and Udell (2006) argue that a country’s lending infrastructure determines the feasibility and importance of these lending technologies. A country’s lending infrastructure includes:

- the information environment (e.g. accounting rules and credit information sharing)
- the legal, judicial and bankruptcy environments

<sup>19</sup> For a more detailed discussion of the mechanics of factoring, the nature of factoring contracts and the academic research on factoring, see Bakker *et al* (2004), Udell (2004) and Klapper, Laeven and Rajan (2012).

- the social environment (e.g. social capital)
- the tax and regulatory environment.<sup>20</sup>

Because of substantial cross-country differences in lending infrastructure, the full list of lending technologies may exist in only a few countries. For example, asset-based lending in its purest form may be limited to a handful of common law countries: Australia, Canada, New Zealand, the United Kingdom and the United States. This is because several necessary conditions in the lending infrastructure need to exist before pure asset-based lending can work.

- There has to be a set of modern laws on security interests in moveable assets that specifically allows for bulk assignment of accounts receivable and inventory.<sup>21</sup>
- 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.
- There needs to be sufficiently strong judicial and bankruptcy systems in place that do not deviate from absolute priority and that will quickly convey property rights in the secured moveable assets 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.
- There needs to be an information sharing mechanism that allows asset-based lenders to efficiently evaluate the quality of accounts receivable.<sup>22</sup>

Factoring provides another interesting example of how the importance of a lending technology varies across countries. For example, in 2002 the ratio of factoring volume to GDP was 11.9 per cent in Italy but only 0.9 per cent in Switzerland (Bakker *et al* 2004). This could be attributable to the relatively poor bankruptcy system in Italy that encourages financial institutions to 'take' the receivables out of the firm through factoring (and thus out of the estate should the company go bankrupt).

Importantly, a country's lending infrastructure is not fixed. While only a few countries currently have lending infrastructure that supports asset-based lending, the list may be growing. For example, in the last 10 years at least three countries have adopted a modern set of commercial laws on security interests designed to facilitate asset-based lending – China, Japan and Vietnam.<sup>23</sup> Both China and Japan appear to have significantly increased lending secured by accounts receivable (and by 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. Rather, it may be more akin to 'borrowing base lending', because – although the collateralisation is the same – it lacks the continuous monitoring of asset-based lending (where loan levels are calibrated on the level of accounts receivable and inventory on a continuous basis). In my view, borrowing base

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20 For more detail, see Berger and Udell (2006).

21 This is sometimes referred to as a 'floating charge' or 'floating lien'.

22 The necessity for efficient information sharing also applies to factoring.

23 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. For more information on the Chinese case, see, for example, IFC (2012).

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.<sup>24</sup>

Similarly, many countries have relatively recently introduced laws allowing factoring, such as those in central and eastern Europe (Bakker *et al* 2004), and more recently Vietnam. Often the impetus for the introduction of factoring is to facilitate export financing – for example, ANZ was given permission to factor receivables in Vietnam through its affiliate, ANZ Bank Vietnam, in 2011.<sup>25</sup>

### 2.2.3 Some thoughts on the lending technologies paradigm

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 each of the lending technologies. For example, the transactions-based technologies are intuitively and uniquely classified by the nature of the hard information associated with each of them. The hard information on which an equipment loan is based is the quantitative information contained in the equipment appraisal – most importantly, the appraised value of the equipment. The hard information in a small business credit scoring loan is the credit score generated by the scoring model used by the lender. These are clearly quite distinct forms of hard information.

The lending technologies framework recognises that lending markets include a number of alternatives to relationship lending. This is important because the early academic literature on opacity and bank lending tended to oversimplify the lending landscape. It tended to view all bank lending as being soft information driven. In this view, smaller opaque firms got relationship loans from banks and large firms got arms-length debt financing from the corporate bond market.

Empirical work has supported the lending technologies paradigm, and implicitly rejected the earlier, oversimplified view of the lending landscape. Recent empirical academic literature on SME financing has found that transactions-based lending technologies – like leasing, equipment lending and factoring – play a vital role in providing credit to SMEs (Bakker *et al* 2004; de la Torre, Martínez Pería 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 labour intensive and thus costly; the underwriting costs associated with small business credit scoring are quite low. Definitive evidence of this cost difference is difficult to find because banks' financial statements do not distinguish between relationship-based loans and transactions-based loans. However, this cost difference is formalised in the strategic framework presented in DeYoung, Hunter and Udell (2004). In this strategic model, technological innovation has driven large banks towards delivering standardised transactions-based products (including transactions-based loans) where they can enjoy economies of scale; small banks have moved towards specialising in personalised products – including relationship loans – which lack economies of scale and are costly to deliver.

24 Cerqueiro, Ongena and Roszbach (forthcoming) analyse the impact on credit associated with a change in Swedish commercial law that diluted the strength of bulk assignment (i.e. the 'floating lien') of accounts receivable and inventory.

25 There has been a considerable amount of research recently (i.e. since the SME finance literature overviews in Berger and Udell (1998, 2006) on lending infrastructure issues, particularly in the area of judicial and bankruptcy infrastructure (e.g. Djankov *et al* 2008; Haselmann, Pistor and Vig 2010; von Lilienfeld-Toal, Mookherjee and Visaria 2012; Gennaioli and Rossi 2013; Vig 2013; Rodano, Serrano-Velarde and Tarantino 2015).



DeYoung *et al* (2004) find evidence broadly consistent with their hypothesis. Specifically, they find a higher net interest margin for smaller banks, which is consistent with compensation for the higher cost of delivering relationship lending and other personalised products.<sup>26</sup>

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

The possibility of organisational diseconomies of scale suggests 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 (Stein 2002).

We turn in the next section to a discussion of SME lending channels. This concept exploits the observed differences in the type of organisations that deliver these lending technologies and provides a potentially powerful lens through which we can frame how lending technologies are delivered. It also offers a useful paradigm to analyse how shocks to the financial system might affect the flow of funding through different lending technologies provided by different lending institutions, because some lending institutions may be affected more than others.

### 3. SME Lending Channels

#### 3.1 The SME lending channels paradigm

An SME lending channel is a two-dimensional concept that pairs a lending technology with a type of financial institution. This paradigm builds on the lending technology paradigm by adding another dimension. It was introduced by Taketa and Udell (2007) as a useful paradigm to analyse the impact of the Japanese banking crisis on SME credit.

Table 2 shows the SME lending channels that existed in Japan in 1990 just before the beginning of the 'lost decade'. The blue cells indicate an operative SME lending channel. Not all lending technologies are offered by all types of lenders. The white cells indicate that a particular lending technology is not offered by a 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 appears to have been eight lending technologies available to SMEs in Japan across six broad classes of institution.

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<sup>26</sup> Carter, McNulty and Verbrugge (2004) find that the risk-adjusted yield on small business lending is higher at smaller banks than large banks, which would also be consistent with large banks delivering lower cost transactions-based loans.

**Table 2: Japanese SME Lending Channels**  
Pre-crisis, 1990

	City banks	Regional banks	Shinkin banks	Government-affiliated banks	Non-bank Shoko	Corporations
Relationship lending						
Financial statement lending						
Factoring						
Equipment lending						
Leasing						
Real estate-based lending						
Trade credit						
Sogo Shosa lending						

Notes: Blue cells show operative lending channels; white cells mean lending channel does not exist – that is, the relevant institution does not offer that lending technology

Contrast Japan in 1990 with the United States today (Table 3). The technologies are different because of the introduction of two new technologies, small business credit scoring and crowdfunding, and the absence of one of the Japanese lending technologies, Sogo Shosha lending. The lenders are also different between Japan and the United States because of the differences in the financial institutional structures.<sup>27</sup> In the United States, commercial finance companies are important players in the SME market for the provision of four of the transactions-based lending technologies – asset-based lending, factoring, equipment lending and leasing. Some of these finance companies are quite large – such as 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.

<sup>27</sup> See Uchida and Udell (2015) for a more detailed discussion of the Japanese financial landscape today.

**Table 3: US SME Lending Channels**  
2015

	Large banks	Small banks	Credit unions	Large commercial finance companies	Small commercial finance companies	Internet	Corporations
Relationship lending		Blue					
Financial statement lending	Blue	Blue					
Asset-based lending	Blue		White	Blue	Blue		
Factoring	Blue		White	Blue	Blue		
Equipment lending	Blue	Blue	Blue	Blue	Blue		
Leasing	Blue	Blue	Blue	Blue	Blue		
Real estate-based lending	Blue	Blue	Blue				
Small business credit scoring	Blue						
Crowdfunding						Blue	
Trade credit							Blue

Notes: Blue cells show operative lending channels; white cells mean lending channel does not exist – that is, the relevant institution does not offer that lending technology

Note that in both Japan and the United States, the largest banks do not provide relationship lending, reflecting the balance of the theoretical and empirical literature. Small business credit scoring is shown as being provided exclusively by large banks, although I suspect that there are a few small banks that use this technology.

### 3.2 SME lending channels and macroeconomic 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 and help to offset contracting channels. The 1990–92 credit crunch in the United States and the recent financial crisis provide useful examples. Each is considered in turn.

### 3.2.1 1990–92 US credit crunch

A considerable amount of research has found evidence of a significant credit crunch in the United States during 1990–92 (Dunkelberg and Dennis 1992; Avery, Bostic and Samolyk 1998; Hancock and Wilcox 1998). A number of different hypotheses about the cause of this credit crunch have been proposed. On balance, the research finds support for several of these, including: regulatory overreaction (from the recent savings and loan crisis); imposition of regulatory leverage ratios; and capital shocks due to loan losses (Berger and Udell 1994).<sup>28</sup>

Table 4 shows what SME lending channels may have looked like during the 1990–92 credit crunch. The two relatively new lending technologies (small business credit scoring and crowdfunding) did not exist in 1990–92. Similarly, two lending institutions did not provide SME financing at that time. These technologies and lenders are accordingly excluded from Table 4.

**Table 4: US SME Lending Channels**  
1990–92 credit crunch

	Large banks	Small banks	Large commercial finance companies	Small commercial finance companies	Corporations
Relationship lending		Yellow			
Financial statement lending	Red	Yellow			
Asset-based lending	Red	Yellow	Blue		
Factoring	Red	Yellow	Blue		
Equipment lending	Red	Yellow	Blue		
Leasing	Red	Yellow	Blue		
Real estate-based lending	Red	Yellow			
Trade credit					Blue

Notes: Blue cells show operative lending channels; red cells show strong contractions across the entire set of institutions; yellow cells mean that some institutions within the set contracted while others did not; white cells mean lending channel does not exist – that is, the relevant institution does not offer that lending technology. In 1990–92, small business credit scoring and crowdfunding did not exist, the internet was not widely used and credit unions were barred from business lending; as such, these are excluded from the table.

The evidence suggests that large banks were particularly hard hit by the macroeconomic shock, which may have been exacerbated by regulatory changes associated with the collapse of the leveraged buyout market. Accordingly, the large bank SME lending channels are designated with red cells in Table 4, indicating that all these banks contracted their lending. The assumption here

<sup>28</sup> See Berger and Udell (1998) for a discussion of the literature on the 1990–92 credit crunch.

is that the shock affected all of the SME lending channels offered by large banks and that all of these channels contracted equally.<sup>29</sup>

Many small banks were also severely affected and one study found more sensitivity to capital shocks in small banks than in large banks (Hancock and Wilcox 1998). However, the small banks' cells are yellow in Table 4, reflecting the likely differences in capital shocks across the small bank component of the banking system – that is, many small banks remained healthy and continued lending.

Perhaps the most interesting aspect of Table 4 is the commercial finance company cells – both large and small. It appears that commercial finance companies may have lent more money as SMEs got crunched out of the banking market. This may have actually increased the quality of their loan portfolios, which historically reflected a riskier class of SMEs.<sup>30</sup> Unfortunately there are not sufficiently good data on commercial finance company portfolios to test this proposition, but discussions with senior managers of these firms are consistent with this hypothesis (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 the most recent crisis, this SME lending channel is shown as open in Table 4, based on the conjecture that – like the commercial finance company channels – trade credit may have actually expanded.

### 3.2.2 Recent financial crisis

Now let's consider what happened to SME lending during the global financial crisis.

As in all crises, separating demand effects from supply effects is a key challenge. Occasionally, natural experiments present themselves that opportunistically create powerful identification strategies (Peek and Rosengren 1997; Khwaja and Mian 2008; Chava and Purnanandam 2011; Lin and Paravisini 2013). This crisis hasn't offered experimental laboratories such as these. The best opportunities for the empiricist to investigate the nature and severity of this crisis have been in Europe, not the United States, because of data availability. Many countries in Europe have credit registries that contain panel data about firms, their loans, and even in some cases information about their loan applications. The best data in the United States had been, until the crisis, the Survey of Small Business Finances. Although the Survey does not contain panel data, it does contain rich information about firms and their loans. However, the Federal Reserve discontinued the survey just before the crisis started. Thus, while the United States was decreasing its investment in data, 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 either: identify supply effects using disequilibrium models to identify credit constrained borrowers (Kremp and Sevestre 2013; Carbó-Valverde *et al* forthcoming); or control for demand effects by looking at access to credit by

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29 While this assumption seems reasonable, we should emphasise that data on most of these lending technologies are not available. Bank financial statements do not break out the commercial loan portfolio into sub-categories. Moreover, even in datasets that provide more information about bank loans, the distinctions are not granular enough to break out the lending technologies used. For example, some datasets such as the Federal Reserve's Survey of the Terms of Business 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 *et al* (1998).

firms with multiple lenders (Albertazzi and Marchetti 2010; Jiménez *et al* 2012; Iyer *et al* 2014). Yet another approach is to use survey data that provides information that reveals credit rationing.<sup>31</sup> Some of these have been single-country studies (Pigini, Presbitero and Zazzaro 2014; Presbitero, Udell and Zazzaro 2014) and some have been cross-country analyses (Popov and Udell 2012; Beck *et al* 2014; Ferrando, Popov and Udell 2015). Overall, these studies have found evidence of a significant credit crunch, and one which had bigger effects for banks under more stress and in countries under more stress.

Based on what we know from the literature about the effects of the crisis on SMEs in Europe and what we know about banks in the United States, we can conjecture what happened in the United States.

Table 5 reflects the fact that both large and small banks were significantly affected by the crisis. Large banks suffered a massive shock related to the subprime residential mortgage market, which began hitting bank capital in mid to late 2007. About 18 months later, small banks took losses in their commercial real estate and construction loan portfolios. Thus, I conjecture that both the large and small bank SME lending channels contracted. Although direct evidence to support this conjecture is not possible in the United States, it is generally consistent with available 'indirect' evidence of a significant supply effect that included small banks (Duygan-Bump, Levkov and Montoriol-Garriga 2011; DeYoung *et al* 2014).<sup>32</sup>

Table 5 shows a contraction by large 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'.<sup>33</sup> The contraction was further exacerbated by the fact that many independent commercial finance companies were acquired by commercial banking organisations after the crisis, thereby losing their independence. A prominent example is Congress Financial Capital; it is an important example because it was acquired by Wachovia, which subsequently failed. It seems likely that commercial finance companies could not have served in the role of safety valve as they did in the 1990–92 credit crunch, and that these SME lending channels *contracted* (Udell 2009). I have seen no evidence on the condition of small commercial finance companies and have left these channels open. Further investigation of this channel would certainly be valuable – but extremely difficult to conduct.

31 The best firm-level surveys ask whether firms sought credit (and whether they were discouraged from applying) and whether they received what they asked for.

32 There is strong evidence of a contraction of supply for larger businesses in a study that looked at the substitution between bank loans and corporate bonds (Duygan-Bump *et al* 2011). 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 businesses in the United States suffered a contraction in credit supply the situation was even worse for SMEs.

33 See quote from a GE Capital spokeswoman Susan Bishop in *The Wall Street Journal* (Mann and McGrane 2014).

**Table 5: US SME Lending Channels**  
2008 financial crisis

	Large banks	Small banks	Credit unions	Large commercial finance companies	Small commercial finance companies	Internet Corporations
Relationship lending		Red	Blue			
Financial statement lending	Red	Red	Blue			
Asset-based lending	Red	Red		Red	Blue	
Factoring	Red	Red		Red	Blue	
Equipment lending	Red	Red	Blue	Red	Blue	
Leasing	Red	Red	Blue	Red	Blue	
Real estate-based lending	Red	Red	Blue			
Small business credit scoring	Red					
Crowdfunding						Blue
Trade credit						Blue

Notes: Blue cells show operative lending channels; red cells show strong contractions across the entire set of institutions; white cells mean lending channel does not exist – that is, the relevant institution does not offer that lending technology

Credit unions were much less affected by the financial crisis, but their lack of penetration into the SME loan market probably precluded them from providing a significant safety valve for SMEs. Moreover, although credit unions are allowed to make commercial loans, no more than 12.5 per cent of their assets can be business lending.

Trade credit likely played a significant role as a safety valve, in the sense that this lending channel likely *expanded*. Data on SME trade credit use is unavailable for the United States. However, data on large company *provision* of trade credit is available. Research exploiting these data found that large businesses with strong liquidity tended to provide more trade credit during the crisis (Garcia-Appendini and Montoriol-Garriga 2013). It is likely that a significant part of this went to the SME sector. Further, this may be true in some other countries as well. A study of SME trade credit use in Spain found that credit-constrained firms substituted trade credit for bank loans when

bank lending contracted (Carbó-Valverde *et al* forthcoming). Cross-country studies of trade credit during the crisis in Europe, however, yield mixed results.<sup>34</sup>

The SME lending channels paradigm can also illustrate how the financial crisis may have propagated from the United States and western Europe to central and eastern Europe. Table 6 shows how SME lending channels in one such country, Croatia, may have looked during the crisis.

**Table 6: Croatian SME Lending Channels**  
2008 financial crisis

	Small banks	Foreign banks	Commercial finance companies	Corporations
Relationship lending	Blue	Red		
Factoring	Blue	Red	Blue	
Leasing	Blue	Red	Blue	
Real estate-based lending	Blue	Red		
Trade credit				Blue

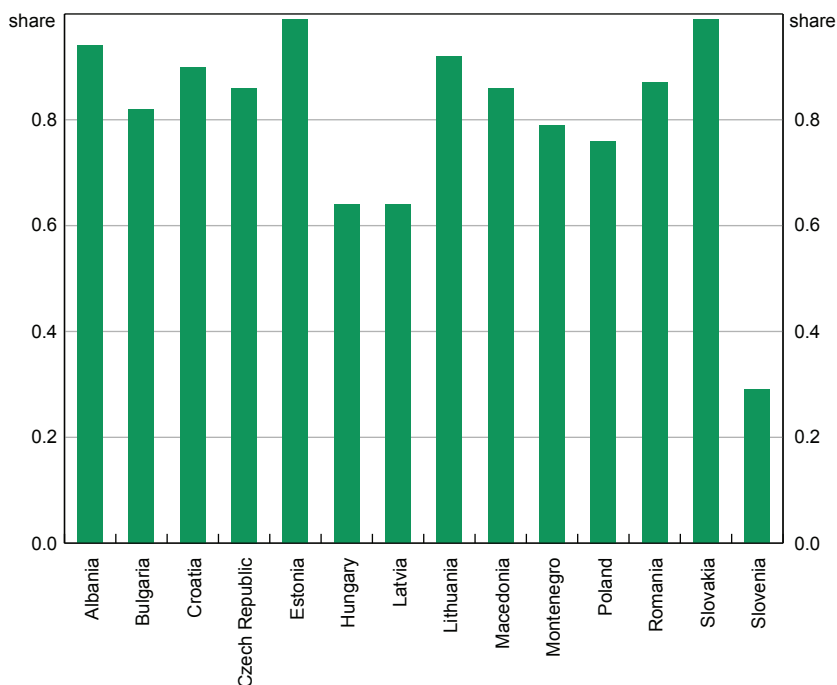
Notes: Blue cells show operative lending channels; red cells show strong contractions across the entire set of institutions; white cells mean lending channel does not exist – that is, the relevant institution does not offer that lending technology

Recent research shows that, in central and eastern Europe, the foreign subsidiaries of multinational banks tended to reduce SME lending more than domestic banks that suffered comparable negative shocks to their balance sheets. The foreign bank effect was disproportionately disruptive because the banking systems in these central and eastern European countries were disproportionately foreign owned (Figure 1).

<sup>34</sup> One study of the 5 largest European countries found that trade credit did not provide a substitute for bank loans during the crisis (Illueca Muñoz, Norden and van Kampen 2015). However, another study of 11 euro area countries found that firms in stressed countries used more trade credit (though not statistically significant) during the sovereign debt crisis and this substitution of bank loans with trade credit reversed itself after the European Central Bank announced its Outright Monetary Transactions program in August 2012 (Ferrando *et al* 2015).



**Figure 1: Foreign Bank Ownership**  
Proportion of banking industry in country that is foreign owned, 2008



Source: Popov and Udell (2012)

### 3.3 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.

The two most common credit multipliers are government guarantee programs and securitisation. Both have mostly been implemented either directly or indirectly by government sponsors. Government guarantee programs have been around for quite some time and are common in both developed and developing economies. SME securitisation – the process of bundling a large number of SME loans into a single security that can then be sold – is a much more recent phenomenon. The efficacy of these two credit multipliers is an unsettled issue in the academic literature. Both are discussed in Sections 4.9 and 4.10, respectively.

## 4. What We Don’t Know: A Top 10 List

Everybody loves a ‘top 10’ list. In that spirit, I offer my own take on the top 10 unsettled issues in SME finance. I admit that there may be some bias in this list because I’m currently working on some of the 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.

## 4.1 Testing the lending technologies and SME lending channels paradigms

Most of the empirical literature on SME finance has focused on specific contract features such as collateral, personal guarantees, covenants and commitments.<sup>35</sup> While we have learned a lot from this literature, we may be missing the broader point.

The SME lending channels paradigm hypothesises that lenders underwrite and monitor loans using distinct lending technologies – that is, *combinations* of specific contract features – and that these technologies may be delivered by distinct *types* of institutions. By focusing on contract features, empiricists may have been focusing on the wrong unit of observation.

There is an emerging literature that examines SME access to finance using the lending technologies and SME lending channels paradigms. However, these approaches face significant data limitations: firm-level survey data and bank financial statements generally do not categorise SME lending in ways that allow empiricists to distinguish among the channels.

### 4.1.1 Lending technologies paradigm

Some of the literature that speaks to the lending technologies paradigm has focused on specific lending technologies. 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 (Giannetti *et al* 2011) and cross-country differences in its importance (Bakker *et al* 2004; Klapper 2006).

Similarly, data in the United States has allowed researchers to analyse the asset-based lending technology, at least in the context of commercial finance companies (Carey *et al* 1998).

More recently there has been research that has more holistically examined the SME lending technologies paradigm. This includes papers that focus on the distinctiveness of the different technologies (Uchida, Udell and Yamori 2008; Berger and Black 2011) and papers that have examined the importance of large banks and foreign banks that deliver a portfolio of transactions-based lending technologies (de la Torre *et al* 2010; Beck, Ioannidou and Schäfer 2012).

However, the paucity of within-country data and cross-country data has severely limited the ability of empiricists to analyse key implications of the lending technologies paradigm. In particular, we do not understand the trade-offs among the technologies offered within a country and why the provision of lending technologies differs across countries. The cross-country dimension is particularly interesting because policymakers need to understand how best to develop lending infrastructure.

Multinational organisations, such as the International Finance Corporation, have assumed an important role in introducing lending technologies into developing economies. However, it is my sense that the data do not yet exist to adequately measure the adoption of lending technologies such as asset-based lending. As discussed in Section 2.2.2, China has introduced a modern set of laws on security interests in moveable assets. But without better data it is difficult to assess whether loans are now being delivered using the asset-based loan technology or as financial statement loans supported by a floating charge on accounts receivable.

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<sup>35</sup> See Berger and Udell (1998) for a review of the literature on contracting.

### 4.1.2 SME lending channels paradigm

Similarly, analysis of the SME lending channels paradigm is constrained by a lack of data. Here there are at least two big issues:

- Which lending technologies are confined to which types of financial institutions?
- How do these channels behave during a shock like the recent financial crisis?

Both of these topics were touched on earlier in the paper. Creative use of existing data sources has allowed researchers to make some progress on each of these. But a lot 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 theoretical literature) and, conversely, that large banks lend to SMEs via transactions-based lending technologies (Berger *et al* 2005; Berger, Rosen and Udell 2007; de la Torre *et al* 2010; Beck, Demirgüç-Kunt and Martínez Pería 2011; Kano *et al* 2011). However, 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). This finding is inconsistent with the theoretical literature.

It is with regard to the second issue that the paucity of research is most acute. As noted above, there are no data with which to analyse whether key channels – such as the commercial finance company asset-based lending channel – expanded during the 1990–92 US credit crunch, even though industry participants assert that this happened to a very large degree.<sup>36</sup> Likewise, there are no data to assess the extent to which large commercial finance companies contracted their asset-based lending (and other SME lending channels) during the recent finance crisis. All we know is that several large commercial finance companies experienced significant financial distress (e.g. CIT and GE Capital). We know virtually nothing about small commercial finance companies. We do not even know whether they were in distress, much less whether they expanded or contracted their lending.<sup>37</sup>

As a consequence, it is very difficult to assess the extent, nature and effect the recent financial crisis had on US SMEs. The study that probably comes closest uses bank-level data in the context of a structural model of bank portfolio lending. It finds evidence that smaller 'community' banks contracted their supply of credit (DeYoung *et al* 2014). However, because small banks are also likely to offer transactions-based lending technologies, this finding does not specifically isolate the small bank relationship lending channel. However, evidence outside of the United States suggests that

<sup>36</sup> An argument could be made that another channel should be added to Table 4: private placements provided by life insurance companies. Historically, insurance companies in the United States had provided long-term fixed rate financing to larger mid-sized businesses in the form of private placements. During the 1990–92 credit crunch, the Board of Governors of the Federal Reserve System commissioned a two-year project to study private placements, 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. The project confirmed the existence of a severe credit crunch (Carey *et al* 1993a, 1993b). 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 Table 4. However, to the extent that some larger SMEs were affected by the contraction of supply in the private placement market this channel should probably be included.

<sup>37</sup> One exception, noted in Section 2.2.1, 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 cannot disentangle overall trade credit extension from the smaller subset of trade credit extended to the SME sector.

smaller banks may have contracted this channel less than they contracted transactions-based lending. In particular, one study found that German savings banks contracted relationship loans less than transactions-based loans (Puri, Rocholl and Steffen 2011).

Firm- and loan-level data in Europe have allowed a much more granular analysis of the credit crunch in the SME sector than in the United States (Jiménez *et al* 2012; Iyer *et al* 2013; Ongena, Peydró and van Horen 2013; Ferrando *et al* 2015). Firm-level data on accounts payable have allowed analysis of the trade credit channel in Spain. These data were used to examine the substitutability of trade credit for bank loans before and during the crisis (Carbó-Valverde *et al* forthcoming).

Firm- and loan-level data in Germany facilitated the analysis of the small bank relationship lending channel noted above (Puri *et al* 2011).<sup>38</sup> A recent study exploited a new dataset that distinguishes between banks that offer relationship lending and those that do not (Beck *et al* 2014). This study used the Banking Environment and Performance Survey undertaken by the EBRD, in which 400 bank CEOs in central and eastern Europe were surveyed about the importance of different loan underwriting techniques, including relationship lending and financial statement lending. By combining this dataset with firm-level survey data, this study found that relationship lending alleviated credit constraints during the crisis.

Although this literature is informative, relatively little is known about western Europe or the other SME lending channels in central and eastern Europe.

## 4.2 Identification strategies

The biggest challenge in studying the effects of macroeconomic shocks on SME access to finance is separating demand effects and supply effects. During a credit crunch it is likely that an aggregate economic slowdown will decrease SME demand for credit. This means identification is critical.

The four most popular methods for identifying supply effects are:

- natural experiments (Peek and Rosengren 1997; Khwaja and Mian 2008)
- firm fixed effects in multi-bank settings (Albertazzi and Marchetti 2010; Jiménez *et al* 2012; Iyer *et al* 2014)
- loan application data (Puri *et al* 2011; Popov and Udell 2012; Ongena *et al* 2013; Presbitero *et al* 2014)
- disequilibrium modelling (Carbó-Valverde *et al* forthcoming).

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 has limitations.

- Natural experiments do not happen very often – and have not presented themselves in the most recent financial crisis.
- 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. First, it is not applicable in countries where single-bank SME relationships dominate, such as the United States. Second, it is not clear that we can extrapolate from

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<sup>38</sup> See Bolton *et al* (2013) for a theoretical model of the role of relationship lending during financial crises.

multibank financial systems – such as Italy, Portugal and Spain – to financial systems like that of the United States; the nature of the financial system architecture may be fundamentally different. For example, the structure of these multibank financial systems may be driven by the fragility of the banking system (Detragiache, Garella and Guiso 2000).

- Identification through loan applications, particularly from firm-level survey data, is often hindered by a lack of sufficient firm-level control variables and a lack of data directly linking the borrower and the bank.
- Disequilibrium models are challenging to calibrate.

The empirical innovations in the area of identification to date – both in terms of data and modelling – have been impressive. But the importance of this area means we require more work expanding the identification ‘toolkit’ and assessing the relative power of the existing tools.

### 4.3 Hardening soft information

Theory argues that organisational form affects internal communication within banks. This in turn affects the lending products that banks can offer. Communicating soft information in large, hierarchical and complex banking institutions is problematic, which makes it difficult for these large institutions to deliver relationship lending (Stein 2002). 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)
- soft information gets diluted as it is communicated through more hierarchical layers (Liberti and Mian 2009)
- soft information gets diluted by a longer distance between the originating bank branch and the bank’s headquarters (Allesandrini, Presbitero and Zazzaro 2009).<sup>39</sup>

All these findings are consistent with theory.

Two important and unsettled issues in the SME finance literature are: what are the boundaries of soft information communication? and has technological innovation changed these boundaries?

These issues are closely related to loan officer discretion: greater loan officer discretion allows loan officers to incorporate more soft information in decisions. There is a growing body of literature that shows that discretion may vary according to loan and borrower characteristics (Cerqueiro, Degryse and Ongena 2011), and that discretion can induce manipulation by the loan officer (Brown *et al* 2014; 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 (Berger 2015). This is sometimes referred to as ‘the “hardening” of small business lending information over time’ (Berger 2015, p 303). This assertion is typically supported by two arguments in the literature: the growing mean distance between borrowers and lenders (Petersen and Rajan 2002; Wolken and Rohde 2002); and the introduction of small business credit scoring (Berger 2015).

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<sup>39</sup> The distance between the branch and the headquarters has been referred to as the ‘functional distance’ (Allesandrini *et al* 2009). Functional distance has also been shown to have been of importance during the financial crisis where a bank’s contraction of the supply of credit was positively related to the functional distance (Presbitero *et al* 2014).

The distance argument holds that technological innovation has increased the ability to use hard information. This has enabled banks to lend when borrowers are farther away from the loan officer or bank branch ('operational distance') and when branches are located further from the headquarters where the final lending decision is made ('functional distance'). Although this argument could be true, the evidence in the literature is not particularly convincing. The observed changes in *median* distance have not been particularly large (Wolken and Rohde 2002; Brevoort and Wolken 2009).<sup>40</sup> Moreover, these changes in distances may have been associated with only one or two lending technologies (small business credit scoring and crowdfunding).

There are two unsettled issues with respect to small business credit scoring and the hardening of information.

- Have hard information technologies – like small business credit scoring – replaced soft information technologies – like relationship lending for micro business lending (i.e. loans below \$100 000)? In other words, is it the case that small business credit scoring has simply replaced other lending technologies, rather than transformed a particular type of information from soft to hard. In this context, the 'hardening' label is a bit misleading.
- Can technological innovation convert some soft information into hard information that can be transmitted within a large complex bank? Many banks quantitatively incorporate loan officer *qualitative* evaluations of management and strategic assessments into the loan *score* (e.g. the loan officer may be asked to rate a manager's skills on a scale of 1 to 5). Of course, at a more fundamental level, if loan officers incorporate soft information into the pricing of a loan through their discretion, then soft information has been effectively 'quantified'. Then the empiricist can reverse engineer this quantified soft information component of the loan (Agarwal and Hauswald 2010; Cerquero *et al* 2011). However, I would assert that this process is not the same thing as 'hardening soft information' in a way that can be transmitted through the hierarchical layers (and functional distance) of a bank. 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 organisation. It has not been established in the academic literature whether technological innovation has facilitated this type of 'lossless' hardening.

#### 4.4 Confusion over collateral

Despite a long literature on collateral, there still persists a misunderstanding of collateral in the context of SME lending. And, consequently, we still need more research on this important contracting tool. Many of the transactions-based technologies are defined by the specific types of assets that can be pledged as collateral.

The biggest confusion is the distinction between 'inside' and 'outside' collateral (Berger and Udell 1998).

Inside collateral refers to assets pledged as collateral that are *owned* by the business (i.e. an asset *inside* 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

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<sup>40</sup> Berger (2015) notes that the change in median distance between SMEs and their bank in Wolken and Rohde (2002) between 1993 and 1998 was only one mile.

'someone' is almost always the entrepreneur or sometimes friends or family. Outside collateral is very common in SME lending throughout the world and typically involves residential real estate.<sup>41</sup>

The two types of collateral have very different effects on loan payouts. In the case of inside collateral, 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 a Modigliani-Miller world, the benefit to the secured creditor would be exactly offset by the increased exposure incurred by the unsecured creditors – the interest rate would fall on the secured loan and the interest rate would rise on the unsecured loan(s), leaving the average cost of capital unaffected.

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. Outside collateral is like a synthetic injection of equity into the firm. Indeed, in a Modigliani-Miller world the entrepreneur could sell their personal assets (that would otherwise be pledged as collateral) and simply inject the proceeds into their firm as equity. Frictions in the real world make this costly.

Both the theoretical literature and the empirical literature conflate the two types of collateral. There is a considerable amount of theory on outside collateral and 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 or why it is ubiquitous. Much of the confusion arises because many theory papers on outside collateral imply that their models apply to all collateral. Confusing the two types of collateral is problematic because inside and outside collateral have very different incentive and signalling effects.

Another source of confusion in the theoretical literature relates specifically to inside collateral. Inside collateral is irrelevant if there is only one lender because the only effect of filing a security interest is to rearrange priorities in liquidation – and the concept of priority requires at least two lenders. Nonetheless, 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 – specifically, 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. All it does is prevent 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. For example, in the United States firms cannot sell equipment (and pay the entrepreneur/owner a dividend) if a security interest has been filed under the Uniform Commercial Code uniquely identifying the pledged equipment with a serial number. However, this control feature does not apply to moveable assets such as accounts receivable and inventory because they are fungible. Thus, this control feature cannot explain why banks routinely take accounts receivable and inventory as collateral. Moreover, the empirical literature has not demonstrated 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

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<sup>41</sup> Outside collateral is essentially irrelevant in lending to large firms because they are owned by a large number of shareholders, all of whom typically own just a small proportion of the firm.

in the data. Many datasets just have a zero-one variable for collateral (e.g. the Federal Reserve's Survey of Terms of Business Lending). This is quite problematic for testing many of the signalling theories of outside collateral, which comprise the bulk of the theoretical work on collateral. These theories predict a negative relationship between borrower risk and pledging collateral; however, the bulk of the empirical literature finds a positive relationship between pledging collateral and borrower risk. Because most of the datasets used in the empirical literature do not distinguish between inside and outside collateral, the findings cannot be viewed as a rejection of the theoretical models on outside collateral.<sup>42</sup>

#### 4.5 Technological innovation and SME lending

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 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. This research should be focused on how technological innovation has affected the mix of lending technologies (presumably through changing their relative costs) and how it has changed the relative size of the SME lending channels.

Small business credit scoring is often used as an example of technological innovation and there is considerable evidence that it has become an economically important lending technology. But, there is not much evidence that small business credit scoring had much – if anything – to do with *technological* innovation. The technology already existed – and had existed back to about 1970 when banks started routinely credit scoring consumer loans (Jessup 1980). The innovation was to meld some firm-level variables onto an existing consumer credit scoring model.<sup>43</sup> Thus, it makes better sense to classify small business credit scoring as a financial innovation, not a technological innovation.

More generally, the academic literature seems to assume that banks have been adopting information technology systems in their commercial lending at the same rapid rate as they have been in their overall operations (asset-liability management, internet banking, compliance activities, information security risk assessment, core processing, etc). However, the academic research has provided little evidence of significant advances in technology related to the production of information in SME lending. For example, it is not obvious that financial statement lending has significantly changed in the last four decades. Although it is true that we can now spread financial statements using Excel, four decades ago it only took a good junior credit analyst about one hour with a manual adding machine. 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 its economic importance.

<sup>42</sup> A few recent empirical papers have started making a distinction between these two types of collateral. For example, Calomiris *et al* (2015) analyse the difference between security interests in moveable assets (which are always inside collateral) and immovable assets (which can be either inside or outside collateral).

<sup>43</sup> While these loan models 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. These ratings existed for decades prior to the introduction of small business credit scoring. For detail on the PAYDEX Score, see Kallberg and Udell (2003).



## 4.6 Audited financial statements

The SME lending channels 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. And informative financial statements can play an important secondary role in the other lending technologies.

The academic literature has recognised the importance of accounting and the accounting infrastructure (La Porta *et al* 1998) as a key piece in shaping the way SMEs are financed and what a country's SME lending channels look like (Berger and Udell 2006). Empirical research on SME access to finance often includes a control variable for audited financial statements (data permitting). This has been done in papers on Europe, North America and Asia (Berger *et al* 2005; Popov and Udell 2012; Uchida *et al* 2012; Ferrando *et al* 2015).

However, a thorough analysis of the audit itself and the *decision* to obtain an audit is missing in the academic literature (Carey, Knechel and Tanewski 2013). The decision to obtain an audit can be viewed as the decision to invest in becoming substantially more transparent. But, this decision comes at a cost because audits are expensive. This lack of research is particularly troubling because the audit decision matters most in the SME sector. This decision may lie squarely on the cusp between a 'small' business and a 'medium-sized' business – that is, right in the middle of the SME space.

To the best of my knowledge there is only one paper that has examined the audit decision in the SME sector: Allee and Yohn (2009).<sup>44</sup> This paper exploited the 2003 Survey of Small Business Finances, which was particularly rich in information on the type of financial statements obtained by firms and variables that might drive the choice. These data also had information that enabled the authors to examine the benefits from an audit in terms of the cost and access to credit. The paper finds that firm 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 and SME literature.<sup>45</sup>

While Allee and Yohn (2009) sheds considerable light on how the audit decision is made, data limitations did not allow the authors to look at the cost side of the cost-benefit trade-off. It is also not clear how applicable the results are outside of the United States. Given the considerable differences in accounting standards and accounting infrastructure across the globe, there is much that we don't know about the costs and benefits of getting an audit.

I think this is one of the most under-researched areas in SME access to finance and more research is definitely called for.

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44 A point also made by Carey *et al* (2013).

45 By my latest count of the 109 Google citations garnered by Allee and Yohn (2009), only 1 has been in an article published in a finance journal where I was not a co-author.

## 4.7 Cooperatives

In my view, cooperative banks are the sector that is least understood in the global banking system.<sup>46</sup> 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 United States, cooperatives have played a major role in financial intermediation. Historically, the most important cooperatives in the United States were the mutual savings and loan associations (S&L). However, with the demise of the S&L industry beginning in the 1980s, credit unions are now the largest type of cooperative. Today S&Ls, mutual savings banks and credit unions hold 13.1 per cent of US banking assets. Credit unions alone have 10 per cent of household deposits. And, like credit unions and cooperatives in many other countries, credit unions in the United States make SME loans.

Are cooperatives interesting from an academic perspective? My view is that they are because of their unique governance and because they are economically significant.

The 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 wealth maximisation is the objective function (although, of course, agency problems drive a wedge between ownership and bank behaviour). There is a considerable body of research on the links between governance, regulation and private bank behaviour, most prominently Laeven and Levine (2009).

In contrast, cooperatives have:

- ownership and control that is not as straightforward
- governance that is more complicated
- an objective function that is not obvious – which may have consequences for SME access to finance.

Moreover, there is little research in any of these areas.

Let's start with the objective function. There is a burgeoning academic literature where principals and agents are driven by a 'higher purpose', as well as wealth maximisation (Handy and Katz 1998; Glazer 2004; Delfgaauw and Dur 2007; Hesse and Čihák 2007; Brekke and Nyborg 2010; Thakor and Quinn 2013). While this literature has not focused on cooperatives, it seems applicable to the issue of whether cooperatives behave more altruistically and ethically than banks.

Part of the missing research on cooperatives is research on how governance actually works in these institutions and the links among governance, regulation and behaviour in the cooperative segment of the banking industry, as in the Laeven and Levine (2009) paper on the private segment.<sup>47</sup>

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<sup>46</sup> Cooperatives can be considered part of the non-traditional component of the global banking system that also includes government-owned banks. Non-traditional banks represent about 40 per cent of the global banking industry (LaPorta, Lopez-de-Silanes and Shleifer 2002).

<sup>47</sup> There certainly has been some interesting research on cooperatives that includes research on the efficiency of cooperatives (Mester 1993; Altunbas, Evans and Molyneux 2001; Carbo, Gardener and Williams 2002; Wheelock and Wilson 2012).

There are reasons to believe that cooperatives do, in fact, behave differently. For example, there is evidence that credit unions:

- discipline banks in small local markets (Feinberg 2001)
- appear to be more scale efficient (Wheelock and Wilson 2009)
- lend to SMEs at more attractive rates than small banks (Angelini, Di Salvo and Ferri 1998)
- have different determinants of failure than banks (Wilcox 2007)
- lend more (Becchetti, Ciciretti and Paolotonio 2014).

An interesting example from the United States related to whether cooperatives behave more ethically involves the change in overdraft policies that most big banks adopted in 2001 and 2002. These banks – allegedly without proper public notice – changed the order in which they processed cheques from low to high (low meaning small cheque amounts) to high to low. This triggered many more cheques being classified as 'not sufficient funds'. Because the penalty fees were assessed per cheque (typically about \$35 per cheque) this change dramatically increased fee revenue. Virtually all of the banks were sued in class action lawsuits and have settled for hundreds of millions of dollars. Evidence suggests that credit unions in the United States were less likely to change their policies to exploit this strategy (Levitin 2010).

However, the news is not all good with respect to cooperatives' behaviour. For example, there is evidence of expense preference behaviour among cooperatives (Mester 1989) and evidence that credit unions in the United States have become less efficient recently (Wheelock and Wilson 2009). Perhaps more interesting is the failure of the *cajas* in Spain during the financial crisis; pre-crisis these institutions accounted for half of the banking industry in Spain. Recent research indicates that when these cooperative banks were spatially deregulated in the decade before the crisis they extended loans to riskier SMEs when they expanded outside their historical market. This strategy was related to political capture (Illueca Muñoz, Norden and Udell 2014).

In summary, more research is needed on:

- the optimal size of the cooperative banking sector
- whether cooperatives are better at some types of lending technologies
- how the cooperative SME lending channels behave during a financial crisis.

## 4.8 Countercyclical macroprudential policy tools

The recent financial crisis has focused policymakers on countercyclical macroprudential policy tools (CMPPTs), which are designed to limit the build-up of systemic risk in the banking system during a bubble period and dampen price increases.<sup>48</sup> At first blush this interest would seem to have little to do with SME access to finance because most of the attention on CMPPTs has focused on the residential mortgage market.<sup>49</sup> This is misleading for two reasons.

1. The residential mortgage market matters for SME access to finance.
2. CMPPTs are not limited to the residential mortgage market.

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<sup>48</sup> For a recent review of the literature on CMPPTs, see Ono *et al* (2015).

<sup>49</sup> See Borio and Shim (2007) and Crowe *et al* (2011).

There are a number of different CMPPTs that have received attention: LTV caps; debt-to-income (DTI) ratio caps; countercyclical capital buffers; and dynamic loan loss provisioning (IMF 2011).

The idea behind an LTV cap is simple: a cap on the LTV ratio for mortgage lending prevents lenders from loosening their standards during a boom and diminishes procyclicality in lending.<sup>50</sup> The same logic holds for DTI caps.

LTV caps – the most common CMPPT instrument – are relatively widespread across the globe (IMF 2011). Moreover, since the financial crisis a number of countries have introduced them, including Canada, South Korea and (most recently) Sweden. However, it has been difficult to empirically assess the effect of LTV caps due to data limitations (IMF 2011).

LTV and DTI caps matter for SME access to finance for two reasons.

1. Entrepreneurs often pledge their personal real estate as collateral. A direct effect could come if the LTV cap includes both the residential mortgage and the business loan. Of course, it could have the opposite effect if the constraint limits mortgage finance but frees up collateral value for a business loan.
2. LTV and DTI caps could be imposed on commercial property, which often secures SME loans. A few countries have done this already, such as Singapore. Moreover, LTV caps could feasibly be imposed on any of the collateral-based lending technologies – for example, LTV caps on inventory lending or equipment lending.

One recent study on Japan addressed the efficacy of an LTV cap on the real estate-based SME lending channels had it been imposed (Ono *et al* 2015). Policymakers and the financial press widely believed that a loosening of credit standards (i.e. an increase in 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. However, this study found that a counterfactual unconditional LTV cap would not have prevented the bubble because the LTV ratio was already countercyclical, not procyclical.

Countercyclical capital buffers – such as those in Basel III – 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 be economically significant.

With respect to the dynamic loan loss provisioning, we have the benefit of a natural experiment in Spain, which 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 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); the other study found that *prior* to the crisis the implementation of dynamic provision caused some banks to increase their appetite for lending to riskier SMEs (Illueca Muñoz *et al* 2014).

Because interest in CMPPTs is so recent, there is very little research on the potential effect of these tools on SME access to finance. Future research will be important in this area as policymakers consider which CMPPTs to implement and how to tailor them.

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<sup>50</sup> The academic literature finds evidence of procyclicality in commercial lending (Berger and Udell 2004; Crowe *et al* 2011).

## 4.9 Government guarantees

Government guarantees of SME loans are one of the two credit multipliers mentioned in Section 3.3. They are on my top 10 list because there is a significant shortage of literature, despite the widespread adoption of these programs and the policy attention they attract.

Not surprisingly, countries around the world have injected considerable funding into these schemes (Cressy 2000, 2002). There is general consensus on the motivation for such programs:

- market imperfections lead to a funding gap in the SME market that loan guarantees can fill
- public sector involvement can spur innovation where it matters most – the SME sector (Hancock, Peek and Wilcox 2007).

The unsettled issue is whether these programs are, on balance, welfare improving. The biggest downside to government guarantees are the adverse selection and moral hazard problems they may create. Some researchers have cautioned that government guarantees reduce social welfare, and suggest that credit decisions may best be left to the private sector (de Meza 2002). However, my sense is that research has suggested positive net benefits from these guarantees, including:

- increasing real economic activity (Craig, Jackson and Thomson 2005; Hancock *et al* 2007)
- decreasing the procyclicality of SME lending (Hancock *et al* 2007)
- mitigating the effects of macroeconomic shocks (Uesugi, Sakai and Yamashiro 2006; Wilcox and Yasuda 2010).

More research is needed on several key dimensions such as:

- Which type of government guarantee programs work best and in what types of environments?
- How well do government guarantee programs work in acute financial crises, particularly the most recent financial crisis?
- Is there a better methodology for assessing the efficiency gains or losses from government guarantee schemes – for example, are short-term benefits in terms of real activity the correct measure?<sup>51</sup>

## 4.10 SME loan securitisation

Securitisation is the second credit multiplier mentioned in Section 3.3. Securitisation was born in the United States in 1968 when the Government National Mortgage Association (GNMA) offered the first mortgage-backed security – the GNMA pass-through. The securitisation of the residential mortgage market rapidly expanded from its initial focus on government-guaranteed and conventional mortgages to 'non-conforming' loans, including prominently subprime mortgages.

Securitisation also expanded into other markets, including commercial real estate, vehicle loans, accounts receivable and music industry royalties. Beginning in the 1980s, there was considerable practitioner and policymaker interest in securitising commercial loans, particularly SME loans. And there now appears to be a resurgence of policy interest in SME loan securitisation, particularly in Europe. No doubt some of this resurgence is driven by the recent credit crunch in the SME sector.

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<sup>51</sup> For a brief discussion of the some limitations associated with research on the US Small Business Administration loan guarantee program, see the conclusion in Craig *et al* (2005).

Policymakers argue that there are a number of benefits to a well-functioning SME securitisation market, including:

- as a bank funding tool
- as an alternative to bank funding
- bank portfolio diversification
- liquidity
- macroprudential benefits from transferring risk away from the banking sector (BoE-ECB 2014).

Policymakers in Europe have actively promoted expanding the SME securitisation market. Most notably, the ECB introduced an Asset-backed Securities Purchase Programme in November 2014 (ECB 2014).

SME securitisation in Europe today represents about 10 per cent of total outstanding debt in the European securitisation market. This is quite large relative to the United States (Altomonte and Bussoli 2014). However, there is a large variation across European countries. The volume of SME asset-backed security issuance has significantly declined since the crisis and the secondary market is moribund.

More interestingly, 90 per cent of outstanding SME asset-backed securities are retained on the balance sheets of the issuing bank – that is, it does not trade – but are eligible as collateral at the central bank (Altomonte and Bussoli 2014). This raises a question: did the European SME asset-backed security market endogenously emerge as a private market or was it fuelled by government support programs in big issuers like Spain?

In the United States, there was much speculation in the late 1980s and early 1990s about rapid growth in securitisation in the SME market. Some pundits claimed that securitisation would become the primary source of SME funding. The reality has been quite different. Securitisation of SME loans in the United States is virtually entirely limited to the federal government's Small Business Administration loans (Berger and Frame 2005). Small Business Administration loans appear to be attractive instruments substantially (if not solely) because of the government guarantee associated with the underlying loans and the standardisation of these loans by Small Business Administration policy (Wilcox 2011).

However, 'indirect' securitisation may be far more important. Indirect securitisation occurs when an entrepreneur uses proceeds from a personal mortgage, vehicle loan or credit card loan to finance their business and *that* loan is securitised. It is very difficult to estimate the economic importance of this type of indirect securitisation; one estimate indicates that it could be as high as 20 per cent of SME debt in the United States (Wilcox 2011).<sup>52</sup>

Taken together, the European and US experience suggests that there may be significant limitations to securitisation as a credit multiplier and a solution to the SME funding gap. Because SME loans are tailored financial contracts that require renegotiation flexibility, securitisation may be of limited value in increasing SME access to finance.<sup>53</sup> It may be feasible in small generic amortising loans,

52 'SME debt' in this context includes the entrepreneur's personal debt used to finance the firm.

53 Renegotiation clearly became an immense problem in the United States with respect to securitised subprime mortgages. Not only was the probability of default on subprime mortgage-backed securities underestimated, but this likely also blinded practitioners and policymakers to the importance of establishing infrastructure to permit renegotiation in the event of a real estate downturn.

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 securitisation.

## 5. Conclusion

This paper assesses the status of the current academic literature on SME access to finance. The last comprehensive assessment was Berger and Udell (1998). Much has happened in the intervening years. If anything, the topic has become more interesting 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 the recent financial crisis.

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

The discussion of lending technologies in Section 2 emphasises that the academic literature has moved beyond a focus on individual loan contract features – such as collateral or covenants – and beyond an emphasis on relationship lending as the primary form of SME lending. Instead, the academic literature is moving toward a more realistic and comprehensive analysis where lenders deploy relatively distinct lending technologies under different circumstances. Beyond relationship lending, these lending technologies include financial statement lending, asset-based lending, trade credit and factoring, among others. Section 2.2.1 briefly summarises the current literature on each of these lending technologies. Not surprisingly, the academic literature on some of these lending technologies – such as relationship lending and trade credit – is quite extensive. But there has also been keen research interest in many of the others – such as factoring and small business credit scoring.

Section 3 shows how lending technologies can be paired with specific lending institutions, for example relationship lending and small banks or asset-based lending and commercial finance companies. Each pairing forms a lending channel. This lending channels paradigm provides a useful framework to assess what happens during a financial crisis or other macro shocks, where some channels may contract while others remain fully open – and some may even expand. Section 3.2 uses the lending channels paradigm as a way of framing the growing body of research on how the recent financial crisis affected SME access to finance in Europe and the United States.

Finally, I assess 'what we don't know' by offering a list of the top 10 unsettled issues in SME finance. This assessment of the research frontier builds on the earlier discussions of lending technologies and lending channels. For example, the unsettled issue of whether soft information can be hardened is important in assessing how the mix of SME lending technologies might change over time and across countries. Likewise, the unsettled issue of how to best identify supply effects

from demand effects is important in assessing how lending channels behave during a financial crisis. Some of the top 10 unsettled issues in SME finance are directly related to key policy issues:

- How important is the cooperative component of the global financial system to SMEs?
- How will countercyclical macroprudential policy tools affect SME finance?
- Do government guarantee programs work?
- How viable are SME loan securitisation programs?

I think it is safe to say that while we have made enormous progress in our understanding of SME finance, further research is much needed.



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