FINANCING SMEs IN EUROPE

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1. FINANCING SMEs IN EUROPE – SOME STYLIZED FACTS

By Morten Balling[1], Beat Bernet[2], Ernest Gnan[3]

Small and medium-sized enterprises are a centrepiece of Europe's economy. Due to their limited size and their generally lower creditworthiness, their access to financial market instruments is more limited than for large enterprises, which benefit from more elaborate Treasury operations, economies of scale also in their financing operations and, in particular, from access to securitized lending and stock markets. These limitations for SMEs may seriously limit their expansion potential and, in particular when it comes to lack of risk capital, their innovation and R&D activity.

Against this background, a conference on "Financing SMEs in Europe" was jointly organised by SUERF and the Banque de France on 11 and 12 September 2008 in Paris. The conference addressed three issues: First, major theories of SMEs' financing behaviour were presented and evaluated. Second, the nexus between financing constraints and the growth and profitability of SMEs was investigated empirically on the basis of cross-country and a number of individual country case studies. Third, the special role of bank credit for SMEs, the consequences of Basel II on credit risk analysis and SMEs' possible strategic replies were discussed. This article aims to provide an overview of major lines of argument and insights derived from the conference,[4] and draws some conclusions for the current financial crisis and economic downturn and for the longer-term.

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[4] The aim is to provide a synthetic overview of contributions deemed most relevant for the topic at hand, rather than following the chronological order of the conference. Papers referred to which are displayed in bold italics are included in this SUERF Study, with other papers being in bold script. Versions of other papers presented at the event can be found in the 2009/4 issue of the Belgian Financial Forum's Revue Bancaire et Financière

1. Financing Behaviour of SMEs – Competing Theories

There are competing theories for how SMEs choose among various forms of finance. The pecking order theory claims that the cheapest source of finance is used first. The static trade-off theory states that marginal financing costs drive financing decisions, as a result additional financing is used from various sources in parallel. The asset side theory argues that the use of funds (i.e. a firm's asset side) matters for the optimal source of finance. Bartholdy and Mateus (2008) use Portuguese firm data to test for the relevance of these three theories and do not find support for the first two theories but some support for the third theory. Further research will be required to clarify this interesting question.

2. Financing Obstacles and Firm Growth – Some Comparative Country Evidence

A number of cross country study studies and country case studies presented at the conference show that SMEs indeed face considerable financing constraints, which hamper both their profit and turnover growth. The starting point for the analysis is that asymmetric information between the lender and the borrower of firms may hamper lenders' readiness to provide finance. This in turn would hamper the borrowers' growth performance. **Coluzzi et al., (2008),** use survey information collected from firms by the World Bank to capture an indicator of financing constraints for five euro area countries (Germany, Spain, France, Italy and Portugal). They find that young and/or small firms in principle grow faster than larger and older firms. At the same time, they also face considerably more severe financing restrictions than other firms. Also, firms of the manufacturing and construction sectors are more likely to feel financing constraints, which may be attributable to the high capital intensity of these sectors. As could be expected, increased sales – which reflect better success of the chosen business model – lessen financing constraints. Regarding the impact of financing constraints on growth, the

authors find that more cash flow fosters growth. The probability of financial obstacles (proxied by age, size and other firm features) is found to affect growth for all countries except for Germany. The effect of higher leverage is ambiguous: it fosters growth in some countries (Spain, France and Italy) while it hampers growth in Germany and Portugal.

This latter aspect of the effect of financing leverage on firms' behaviour is further investigated in ***Huyghebaert (2008)***. The author argues that higher leverage creates incentives for an entrepreneur to maximize short-term earnings in order to reduce the risk of adverse credit decisions by lenders and a possibly resulting liquidation of the firm, since firm survival is a crucial consideration for entrepreneurs who typically hold a largely undiversified investment portfolio and enjoy sizeable private benefits from control. The positive effect of higher leverage on profitability is empirically confirmed for start-up firms in Belgium. This positive effect of leverage is also found to persist, albeit growing at a declining rate, as firms age.

Savignac and Sevestre (2008), investigate empirically for a sample of French firms whether small firms and innovative firms are financially constrained. Their study confirms that such firms indeed face a higher interest rate spread than other firms, which reduces their loan demand. Being innovative has a larger negative impact on loan demand for SMEs than for large firms. As expected, the availability of tangible assets which can be used as collateral facilitates SMEs' access to bank credit. By contrast, an existing high debt ratio acts as an obstacle to further credit.

These academic findings were contrasted with a practitioner's view, based on a survey among Dutch firms (**von Dewall, (2007)**). Broadly speaking, the study concluded that external financing constraints are not experienced by conservative, self-constrained firms, while truly expansionary entrepreneurs – which are the minority in the Netherlands – are likely to face financing constraints. While particularly for this minority of strongly expansionary firms lack of risk capital and the absence of well-functioning venture capital markets hamper growth, the bigger problem according to this author seems to be a lack of skills at various levels: entrepreneurial skills at the level of the firm, lack of skills of accountants, and lack of skills at banks in the context of their lending and financing decisions. Banks' moving towards automated expert credit information and evaluation systems might further exacerbate this problem, reinforcing the notion that banks are not the best suited institutions to provide risk capital.

Credit constraints may, among other factors, also contribute to a small firm's motivation to join a larger group. Using a large data set of French firms, **Kremp and Phillippon (2008)**, identify a major shift in the structure of ownership of SMEs over the past decade. In 2006, more than half of French SMEs belonged to a group (i.e. at least half of their capital belonged to another firm), against 80% in 1997. Over the same period, the number of holding companies tripled. Holding companies now account for one third of non-financial enterprises' outstanding bank debt. Membership in a group can strongly affect a firm's financing behaviour, e.g. in the sense that the holding company borrows from banks for the group as a whole, while the group's member firms turn to the holding company for financing. The strong drive towards membership in firm groups is rooted in several motivations: Group membership alleviates credit constraints faced by individual small firms, facilitates access to foreign markets, or can also be the chosen exit strategy in the event of retirement of the current owner or manager. Joining a group is shown to improve SMEs' growth and survival rates, more so even if they join a foreign group.

Optimal growth conditions for enterprises are particularly important in developing countries. It is all the more worrisome that a cross-country study on firms' financing conditions in transition economies (**Volz (2008)**) finds that firms in transition economies continue to be seriously financially constrained – a large fraction of firms in these countries still have no bank loans, particularly small firms continue to have problems of access to financing. The – forced – strong dominance of internal financing for small firms hampers firm development. Surprisingly, banking system reform may even have worsened access to finance for SMEs. In principle, the entry and operations of foreign banks should bring a transfer of know how and increase the efficiency of a transition economies' financial sectors. However, in practice foreign bank activity seems to benefit primarily larger firms, with smaller firms being more or less left out. Furthermore, higher concentration in the banking sector is found to improve financing conditions for SMEs. This is in line with the monopolistic-creditor hypothesis (see Petersen and Rajan (1995)), which states that a quasi-monopolistic situation in banking could help banks to establish a mutually beneficial relationship with firms.

3. Bank Credit, Credit Risk Analysis under Basel II, and SMEs' Financing Strategies

Due to SMEs' limited access to securitized forms of financing, banks play a crucial role for SMEs' external financing. Bank credit restrictions therefore affect SMEs more severely than large firms. In this context, the conference addressed several interesting aspects in this context: First, do bank loans and trade credits affect SMEs' investment behaviour differently? Second, what effects for credit supply can be expected from rating rules under Basel II, and how can SMEs adjust to this new framework? Third, to what extent can risk diversification effects be expected to come into play in banks' SME credit portfolios? Fourth, if banks' internal credit rating systems differ, might this result in different credit ratings for one and the same SME, and might this in turn prompt "credit rating arbitrage" on the part of SMEs? Fifth, what are the mutual relationships between macroeconomic developments and firms' financial fragility? And finally, to what extent can "group borrowing", e.g. in the form of mutual guarantee schemes, help SMEs to secure more favourable credit ratings?

Regarding the *first* aspect, **Carbó–Valverde et al. (2008)**, investigate the question as to whether the empirically observed correlation between investment and cash flow is a good indicator of financing constraints for a large sample of Spanish SMEs. Contrary to the established literature, they use an alternative approach, considering recourse to bank loans versus trade credit. They find that investment is sensitive to bank loans for financially unconstrained firms, while trade credit predicts investment for constrained firms. By granting trade credit to other firms, unconstrained firms act as "financial intermediaries".

Relating to the *second* question, a much-discussed issue is whether, and if so how, the new Basel II Capital Accord and the Capital Requirements Directive could affect access to, and the cost of, credit for SMEs. Although SME funding by banks which use either the standardized or internal ratings-based approach are subject to a lower capital requirement than loans to large firms, the Basel II Accord still implies that more risky loans face higher capital charges. To the extent that SMEs are more risky, they may face higher credit costs than larger firms.

Starting from an overview of SME financing and the main constraints to SME financing by banks, ***Ayadi (2008)*** evaluates the likely impact of the Capital Requirements Directive and Basel II on SME financing in Europe. Basel II will increase banks' administrative costs to originate and manage the credit portfolio according to the more sophisticated rules; it will increase the cost of the banks' own resources; and it may possibly entail higher risk premiums to the extent that SMEs represent above-average risks. In an economic downturn, Basel II may accentuate pro-cyclical bank lending behaviour.

Ayadi proposes a broad range of measures to improve SME financing under the new rating culture: First, banks should improve transparency on their internal ratings (with the optimal degree of such transparency being discussed quite intensively at the conference), give reasons for down or upgrades and credit decisions and provide financial advice. SMEs should strive to better understand banks' loan requirements, deliver clear, complete and timely financial and performance data, and improve rating-relevant factors (such as cash flow, equity, accounting, controlling, management, the business strategy, collateral and guarantees. Public policy should promote a code of conduct for minimum ratings disclosure, foster venture capital, and improve tax treatment of retained earnings.

Regarding the *third* topic, **Dietsch and Petey (2008)**, investigate a specific issue relating to capital requirements for banks' SME loan portfolios, namely the diversification potential within large portfolios of SMEs. Extending the standard one-factor credit default model to multiple factors, which takes into account size, sector and location, they compute economic capital allocations for large portfolios of French SME loans. They find that two opposing effects are at play when estimating aggregate credit risk for an SME loan portfolio: on the one hand, diversification decreases economic capital; on the other hand, a more complete representation of default rate dynamics in such a framework increases economic capital. As to be expected, portfolio risk diversification in large SME loan portfolios depends on the heterogeneity of the firms in the portfolio, in particular in terms of cyclicality or industry, and size. They conclude, first, that the standard one-factor model and its applications do not properly take into account potential diversification effects in an SME loan portfolio. Second, however, a model that takes into account diversification effects might still generate higher required capital levels, because it captures credit risk better.

Regarding the *fourth* question, ***Bernet and Westerfeld (2008)***, start from the fact that internal rating models used by banks to evaluate SMEs' creditworthiness differ substantially with regard to the underlying rating philosophy, the rating system architecture and rating model calibration. They test for a representative sample of Swiss SMEs whether different rating models lead to different risk classifications, even though identical input data are used. Their finding that different rating models indeed yield different rating results opens the possibility of "rating arbitrage" by creditors between various banks. The authors also investigate whether inclusion of qualitative information leads to more favourable ratings, compared to ratings based solely on quantitative data; contrary to other research, their empirical findings do not confirm this notion.

The *fifth* issue of how macroeconomic fluctuations affect firms' financial fragility was also taken up by **Bruneau et al. (2008)**. Using stress tests, they confirm that macroeconomic conditions affect firms' financial fragility. Conversely, they also show that microeconomic data on financial fragility can be useful as a leading indicator for business cycle developments at the macro level.

As regards the *final* issue, one way to overcome informational asymmetries and banks' caution in granting credit to risky SMEs is to "outsource" some of banks' financing functions. An interesting case study in this respect concerns Mutual Guarantee Institutions (MGIs), a form of group lending, in which banks, instead of lending to a single borrower, lend to a group of borrowers which are jointly responsible for honouring the liability. MGIs are quite widespread, particularly in Germany, France, Spain, and, above all, in Italy: According to the European Mutual Guarantee Association, currently there are more than 1.4 million SMEs affiliated to an MGI. **Columba et al. (2008)**, show that such schemes are indeed able to reduce SMEs' financing costs. The main rationale for this alternative contractual relationship to effectively mitigate information asymmetries is that each member of the Mutual Guarantee group is better informed of the other associated firms than a bank would be, given that group members are mostly part of the same local community. Thus, MGIs perform useful screening and monitoring functions among associated firms. MGIs may under certain conditions also reduce regulatory capital requirements for banks granting credit to them. Finally, MGIs pool several small firms' credit needs and increase those creditors' negotiation power vis-à-vis creditor banks.

4. Some Conclusions for the Current Financial Crisis and for the Longer Term

The conference has shown that the factors driving SME financing decisions are complex, as reflected inter alia by an ambiguous theoretical and empirical literature. However, it seems safe to conclude that there is a substantial fraction – maybe one third – of financially constrained SMEs. These constraints indeed seem to hamper investment and innovation, and thus growth, employment and welfare. In addition, lack of skills at various levels (entrepreneurs, banks, firm owners…) may also be important. Various measures to improve the situation are feasible and realistic and should be targeted at the SMEs themselves, financial intermediaries, and at public policy in general.

Debt financing continues to be the primary source of financing for SMEs in Europe, much more important than venture capital. This implies, for one thing, that an efficient functioning of credit markets is of utmost importance for SMEs – and the economy at large – to thrive. This problem seems to be particularly severe in transition economies, whose catching-up may suffer from continued wide-spread exclusion of SMEs from external bank finance.

The continued small role of venture capital financing brings back to mind the lack of developed venture capital markets in most European countries. The latter seem particularly important for the most innovative and expansionary firms. Europe foregoes growth potential by not solving this issue. But a more prominent role of venture capital – and more generally risk capital – in SME financing could also act as a welcome buffer for cyclical fluctuations. A higher share of equity financing (e.g. through venture capital) would be expected to make firms' balance sheets more robust to (severe) economic fluctuations. Maybe, the current crisis will trigger renewed efforts to develop this hitherto rather neglected form of financing.

The studies presented at the conference show that in the majority of European countries, bigger financial leverage of SMEs is associated with higher profit and sales growth. Debt may thus serve as an incentive to perform well, particularly for young start-up firms. Higher leverage may also reflect a firm's quality in the sense that more talented entrepreneurs are willing and able to obtain more credit.

At the same time, higher leverage also entails higher risk, be it due to rapidly deteriorating economic conditions, be it due to a rapid rise in risk premiums on loans and possible quantitative credit constraints. The increased risk-sensitivity of the Basel II framework may accentuate the tightening of SMEs' financing conditions in an economic downturn. Deteriorating payments behaviour in a downturn may also undermine SME's commercial transactions, casting additional doubt on SMEs' creditworthiness and leading to a further curbing in lending would thus probably be particularly serious for SMEs. The Basel II framework may induce or increase the pro-cyclical effects of banks' lending behaviour (see ***Ayadi (2008)***), particularly so in times of financial system dysfunctioning.

The threat of a "credit crunch" in bank lending would thus likely hit SMEs particularly hard. (while, at the same time, the recently observed drying up of securitized lending and stock market issuing affect larger enterprises more strongly). To limit real economic consequences for SMEs' continued smooth operation, government and central bank measures to maintain or, where necessary, re-establish banks' ability and/or willingness to lend are crucial. As has been shown by co-ordinated measures of European Governments and central banks, the authorities are fully aware of this and are ready to act accordingly.

As always, while the conference shed light of many important issues, others remained to be answered. For instance, it could not be convincingly clarified whether easy access to credit supports profits/growth or whether the causality may (also) run in the opposite direction. What are the true reasons underlying financial constraints? Are the constraints, which are for instance quoted in firm surveys, real or just perceived? What should be the role of public policy given positive externalities of radical innovation for the economy at large? It will be for future conferences and research projects to address these and other issues.

What the conference could definitely achieve is to contribute, through many cross country and case studies, to benchmarking and mutual learning across countries and across SUERF's three constituencies, central banks (and public authorities at large), financial intermediaries (and the private sector at large), and academic researchers.

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N. Huyghebaert, (2008), Financing of Business Start-Ups: A Topic of Great Relevance for Firm Performance, Growth and Survival

Gaspar, Vítor, Simona Bovha-Padilla and Reinhilde Veugelers, (2008), Finance for Innovation and Growth

2. FINANCING OF BUSINESS START-UPS:A TOPIC OF GREAT RELEVANCE FOR FIRM PERFORMANCE, GROWTH AND SURVIVAL

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Abstract:

In this paper, we consider what determines the capital structure of business start-ups. Empirical research shows that when information and incentive problems are potentially large, banks limit their fraction of total financing. Conversely, banks are willing to invest more in firms with promising growth prospects. Besides, entrepreneurs who highly value private benefits of control structure their financing so as to reduce the likelihood of premature liquidation. Thereafter, we look at the implications of financing decisions for firm performance, growth and survival. Empirical research here reveals that business start-ups with higher leverage are not only more profitable, but also report higher growth in earnings over time. Yet, leverage also makes firms vulnerable to financial market predation, which reduces their survival chances.

1. Introduction

When examining the role of finance in entrepreneurial business start-ups, it is important to keep in mind the following firm characteristics. First, information asymmetries between firm-insiders, i.e. the entrepreneur, and outside financiers are large, as no historical information is available on newly established ventures. These firms just lack a prior financial and operating history. Also, business start-ups are subject to less stringent rules regarding information disclosure than are large listed firms. Moreover, start-up firms do not have a reputation at stake that can reduce asymmetric information and moral hazard concerns in the spirit of Diamond (1991). Second, the failure rates of business start-ups are known to be huge. The literature has documented repeatedly that about 50% of new entrepreneurial ventures disappear within the first five years after their establishment (e.g., Berger and Udell, (1998); Huyghebaert and Van de Gucht, (2004)). Hence, the issues of adverse selection before a financial contract is written and ex-post risk-shifting incentives cannot be ignored. Third, ownership is typically highly concentrated in the hands of the entrepreneur and perhaps also some friends and members of the family, who are willing to assume and share risk. Although the latter informal financing channels are even more important in developing countries, their role in more developed economies in Europe and even the USA is not trivial either. Because of this ownership structure, without separation of ownership and managerial control, agency problems of equity are negligible, whereas private benefits of control can be quite substantial. In the context of entrepreneurial firms, private benefits of control include the prestige and status that comes with ownership, the power to decide on the business strategy of the firm, and independence from superiors (see Huyghebaert et al. (2007)). These private benefits of control can explain the reluctance of entrepreneurs to raise equity from outsiders. Also, because of control rents, entrepreneurs sometimes are willing to stay in self-employment, despite their lower income, whereas they may be unwilling to liquidate their venture when outside financiers consider this to be the most efficient solution. Private benefits of control tend to reinforce risk-shifting incentives once the firm is heading for financial distress.

In this paper, we elaborate on the implications of the above firm characteristics for the financing decisions of business start-ups. So, in the first part of this article, we consider what determines the capital structure of business start-ups. We look at the generalizability of research outcomes in this stream of the

literature to the more general context of small- and medium-sized enterprises (SMEs) and point out some avenues for future research. In the second part of the paper, we discuss the implications of financing decisions for firm performance, growth and survival, from which we draw some conclusions for public policy.

2. Financing decisions

When considering the sources of financing that are available for entrepreneurial business start-ups, it seems that traditional newly established firms usually do not rely upon venture capital (e.g., Ooghe et al. (1991); Berger and Udell (1998)). In general, external financing sources are limited to bank loans and trade credit in the first few years after start-up. Berger and Udell (1998), among others, already pointed this out when stressing the importance of the 'life cycle paradigm' for SME financing decisions. For US firms, Berger and Udell claim that the sources from the principal owner, bank loans and trade credit account for 70% to 80% of total financing for SMEs, independent of firm size and age. For Belgian business start-ups, Huyghebaert and Van de Gucht (2007) demonstrate the huge reliance of these firms on debt financing. The median company raises 82% of its total sources by means of external debt (in their definitions, debt never includes the loans the entrepreneur extends to her own company). About half of this debt – 45% to be exact – is contracted from banks, whereas trade credit accounts for about 25% of total debt. The other debt largely consists of liabilities vis-à-vis the workforce, tax authorities and prepayments from customers. Leasing is only marginally important for the enterprises in their sample (4%). Besides, the debt that is being raised in the start-up year has to be repaid on short notice. The maturity structure of borrowings indeed reveals that most debt has a maturity less than one year. However, when focusing solely on the outstanding bank loans, only 20% of outstanding bank debt has to be repaid within the coming year.

Within this sample of business start-ups, Huyghebaert and Van de Gucht (2007) use a simultaneous equations model to examine the joint determinants of leverage, the fraction of debt that consists of bank loans, and the maturity structure of these bank loans. Although the literature has argued repeatedly that banks, through their screening and monitoring of borrowers, have an

advantage in financing informationally opaque firms, the empirical results in the study of Huyghebaert and Van de Gucht (2007) reveal that when adverse selection problems are potentially large, banks actually finance a smaller fraction of total debt, ceteris paribus. The same applies to incentive problems between borrowers and lenders. When risk-shifting incentives are potentially large, banks actually finance a smaller fraction of total debt, all else constant. Adverse selection and risk-shifting problems do not affect the maturity structure of these bank loans, however. Interestingly, when start-up firms rely less on bank loans for their financing, they turn to leasing companies and – especially when leasing is not easily accessible – to trade credit. Arguably, these results thus suggest that lessors and suppliers use other mechanisms than banks to reduce information and incentive problems. Nonetheless, business start-ups are not able to fully compensate their more difficult access to bank debt by relying more on these alternative financing sources.

Overall, the empirical findings in the article of Huyghebaert and Van de Gucht (2007) point out that when information and incentive problems are potentially large, banks do not finance a larger proportion of total debt. These results thus conflict with the theoretical framework in the corporate finance literature up till now, where it has been argued that by specializing in the assessment and monitoring of borrowers, banks can overcome the problems of duplication of efforts and free-riding among lenders (Diamond (1994)). However, the results also reveal that banks do not decide to stay out of these enterprises all together, but simply finance a smaller fraction of total debt, possibly to reduce their exposure to potential losses upfront. Simultaneously, by providing at least part of total financing, banks can secure that a long-term relationship that may pay off in the future can be built up with these firms. Given their lower involvement in the financing of risky business start-ups, banks no longer feel a need to reduce their exposure to information and incentive problems by shortening the maturity of their loans, which allows terminating the contract when bad information is obtained and/or expropriation is detected. In sum, these results suggest that banks are not largely involved in the screening of borrowing candidates. In a follow-up study, Huyghebaert et al. (2008 mimeo), who analyze the earnings management incentives of business start-ups, find that newly established ventures in need of a first bank loan manage their earnings upwards by means of trade accruals and non-cash working capital accruals. However, this earnings management does not affect the lending decisions of banks either, not in a positive manner when entrepreneurs are able to positively influence bank lending decisions, but also not in a negative manner when banks penalize companies for the information risk resulting from higher accruals. These results again question the idea of extensive

screening by banks in the start-up context. We are aware, however, that these results may be difficult to generalize to other SMEs. Nonetheless, the above findings raise questions about how relationships between banks and firms are actually developed. Indeed, our knowledge of how firms acquire a reputation in the bank loan market is only limited. What type of information do banks actually collect? How frequently do they do this? Etc. These are questions we are far more familiar with when considering venture capital contracts as opposed to bank loans. Up till now, researchers typically have used the 'length of the lending relationship' as a proxy for private information that was collected by the bank over time, but this measure seems to be a black box, especially in the context of business start-ups and even in the broader context of SMEs. Hence, more research seems needed to further explore what banking relationships mean and imply for these firms. Thereby, one may have to take into account that when firms are very small and when screening and monitoring is complex, the latter activities may be cost ineffective from the point of view of banks (see also Ravid and Spiegel (1997)).

Besides, Huyghebaert and Van de Gucht (2007) document that banks are willing to lend to business start-ups with promising growth prospects, although these firms have a lower total debt ratio. These results again support the notion that banks may be interested in building up relationships especially with companies where the payoffs from such relationships tend to be higher. Once business start-ups in industries with a high-growth profile reach the growth stage, banks indeed may be able to reap the full benefits of having invested in a long-term relationship. Some authors have argued that banks earn rents from investing in relationships with their debtors. Consider the study of Degryse and Ongena (2005), who point out that banks charge higher loan rates to borrowers that are located closest to their bank branch. From these results, Degryse and Ongena infer that local banks are able to earn location rents from developing relationships with clients in close proximity. Here too, we do not know yet much about such inter-temporal substitution effects. While Petersen and Rajan (1994) find that the development of a banking relationship positively affects the availability of bank loans, they also conclude that the length of the relationship virtually has no impact on the price of this financing. Some authors have pointed out that collateral requirements decrease over the course of a lending relationship, while other studies have shown that the price of bank loans actually increases as firms develop a relationship with their bank (e.g., Degryse and Van Cayseele (2000)). So, there is room for a further examination of these dynamics in lending and borrowing decisions. More importantly, we believe that these research questions can best be answered in the context of SMEs, including

business start-ups, which have little alternative financing options than bank loans. Detecting such behavior in the context of large, listed firms may indeed be very difficult, because these firms may not accept bank hold-up behavior and turn to public debt and public equity markets. This is not to say that SMEs are defenseless against bank hold-up behavior. They indeed can develop multiple banking relationships, but this is again a topic we are not very familiar with. As an example, how do firms decide on the mix of loans raised from multiple banks? What is the minimum stake banks have to assume in order to perform screening and monitoring activities? Etc.

In addition to these supply-driven determinants, Huyghebaert and Van de Gucht (2007) demonstrate that the demand side has a huge impact on capital structure, too. Entrepreneurs who highly value private benefits of control structure their financing so as to reduce the likelihood of premature liquidation. More specifically, they rely less on bank debt and short-term bank loans in particular. These results are consistent with the idea that banks follow stricter liquidation rules than suppliers, as has been pointed out by Wilner (2001), Franks and Sussman (2005), and Huyghebaert et al. (2007), among others. Huyghebaert and Van de Gucht (2007) even find some evidence that entrepreneurs who highly value private benefits of control limit their overall debt ratio. In this area, further research could investigate how entrepreneurs who operate in a team make corporate finance decisions, as the meaning of 'private benefits of control' is likely to be different in such a context.

Future research could also focus on how financing decisions evolve over time, as firms grow older (see also Huyghebaert (2006)). We indeed expect the influence of firm age on capital structure to be more fundamental than the impact of firm size. Overall, little research has examined capital structure in the more general context of small and medium-sized enterprises, mostly because of the difficulty to obtain data on these firms. Nonetheless, this limited research on the capital structure of SMEs shows that the results that apply to large listed firms also largely arise in samples of SMEs. In a recent study, Daskalakis and Psillaki (2008) find that asset structure, firm size, profitability and growth affect the debt to assets ratio in a comparable way for SMEs in Greece and France during 1998–2002. Likewise, Sogorb-Mira (2005) concludes that the debt ratio is negatively affected by non-debt tax shields and profitability, while positively influenced by firm size, asset structure, and growth opportunities in the context of Spanish SMEs during 1994–1998. When examining the maturity structure of bank loans, Berger et al. (2005) find that asymmetric information and risk affect bank debt maturity in SMEs in a way that is similar to what has been documented for large, listed

firms. So, these variables negatively affect the maturity structure of bank loans, and this in contrast to the results for business start-ups (Huyghebaert and Van de Gucht (2007)).

Given the above results and discussion, we argue that it is more appropriate to distinguish firms based upon differences in firm age rather than to classify firms based upon their size. Further support for this conjecture is obtained when looking again at the summary statistics in the study of Berger and Udell (1998), but for US data. Firm size is shown not to have much impact on firm financing decisions. The most significant change that takes place as firm size increases, is that the principal owner reduces his/her stake in the firm, thereby suggesting that he or she aims for portfolio diversification. As a result, the debt ratio increases, but the main debt sources (i.e. loans from commercial banks and trade credit) grow by a similar percentage and thus remain equally important. The impact of firm age on capital structure is documented to be more significant, however. In the first stage, from infant to adolescent, firms substantially increase their borrowings from banks, while trade credit is not largely affected. As firms reach the middle-aged stage and the old stage, these bank loans are being repaid, thereby reducing the debt ratio again. At the same time, the stake of the principal owner increases, probably because of retained earnings. So, firms obtain access to internal sources of financing as they grow older, which allows reducing their reliance on bank loans, consistent with the pecking order theory of capital structure.

When looking at the above issues in a wider European context, Wagenvoort (2003) already pointed out that these same conclusions regarding the impact of firm size apply to most European countries, that is firm size does not significantly affect corporate finance decisions. However, the study of Wagenvoort also reveals a few exceptions to this general finding. For Austria, Germany and Sweden, Wagenvoort shows that the use of financial debt reduces substantially with firm size. Overall, we do not know what is driving these differences in results across European countries. Although some researchers have documented that the determinants of capital structure are comparable around the world (see, e.g., Rajan and Zingales (1995); Booth et al. (2001)), we conclude from the above results that more research is needed on cross-country differences in the determinants of financing choices. More specifically, we believe that it is worthwhile to investigate in more detail the impact of differences in institutions and financial market development across countries on corporate finance decisions. Thereby, researchers also have to better explore the specificities of SMEs, in particular their asymmetric information with outside financiers, their higher failure risk, and their

owner's desire to maintain control. Giannetti (2003) has an interesting paper on this topic for Europe, but she concentrates on firms included in the Amadeus database. So, most firms that are examined by Gianneti (2003) exceed the size criteria for SMEs, as their number of employees is larger than 250. Finally, a recent study by Beck and Demirgüç-Kunt (2006) points out that cross-country research casts doubt on a causal link between SMEs and economic development, while the authors stress the role of institutional and financial development. Yet, we believe that SMEs simply may not be able to contribute to economic growth when they face difficulties in accessing the formal sources of external finance. So, this argument points out once more that it is necessary to also investigate more extensively the relation between the quality of institutions and the capital structure of SMEs.

3. Implications of financing decisions for firm performance, growth and survival

In a recent article, Franck and Huyghebaert (2008 mimeo) examine whether having a lot of debt outstanding improves or hampers firm performance in the first few years after start-up. According to Modigliani and Miller (1958), financing decisions should not affect product market outcomes, as long as financial and product markets are perfect. So, Franck and Huyghebaert (2008) argue that leverage can affect firm performance only when some market imperfections pertain. When outside financiers do not have the same information about firm quality as do firm insiders and when it is difficult for insiders to credibly transfer this information to outsiders, an important *financial market imperfection* arises. Regarding *product market imperfections,* firms may recognize the impact of their decisions and behavior on one another when the number of competitors in a market is limited. Rival firms may then engage in predation to drive entrants out of their market, provided that the benefits of doing so outweigh the costs (see also Huyghebaert and Van de Gucht (2004)).

Franck and Huyghebaert (2008) focus on the above two market imperfections and investigate how the incentives of an entrepreneur and her rival firms

affect the relation between leverage and post-entry performance in the context of business start-ups. Also, they examine how this relation changes over time, as the entrepreneurial venture grows older. For this purpose, they focus on two complementary measures of firm performance: current profitability and growth in earnings over time. As a number of authors have already shown that profitability is an important determinant of firm growth, through the use of retained earnings (see, for example, Watson, (2006)), examining the link between leverage and internal cash generation in the context of business start-ups can make a further contribution to the literature. Other studies on SMEs have shown that small and medium-sized enterprises are financially constrained and face a financing gap. Cash-flow investment sensitivities are typically large for SMEs and particularly for the smallest and unquoted among them. These studies thus stress once more the importance of internally generated earnings for firm growth and survival.

From a *start-up's* perspective, firm survival is indeed a key consideration for entrepreneurs, as they usually hold a largely undiversified portfolio, have pledged personal assets to secure their firm's bank debt, and enjoy sizeable private benefits of control. So, entrepreneurs may take into account that, given asymmetric information, weak firm performance in one year could reduce their firm's access to future financing from banks and could even lead to firm liquidation following default. As a result, entrepreneurs may have incentives to boost short-term profitability, especially in the first few years after start-up, when information asymmetries are large. These incentives are likely to rise with the firm's debt ratio, as the probability of default tends to increase with leverage because of higher interest payments and capital installments. As banks are fierce liquidators following default (e.g., Wilner (2001); Franks and Sussman (2005); Huyghebaert et al. (2007)), firm survival could be jeopardized. So, entrepreneurs in high-debt ventures may focus especially on projects that generate high immediate earnings in order to meet their large debt-payment obligations. These entrepreneurs could even initiate projects that raise short-term profits to the detriment of projects with smaller initial earnings, but a larger net present value. Hence, more highly indebted business start-ups could be largely incentivized to boost their short-term EBITDA, ceteris paribus. For a given level of profitability, leverage-induced efforts to increase firm performance may also result in a higher EBITDA growth rate when firms have more debt outstanding. However, as newly established ventures grow older, information asymmetries decrease and firms typically start to generate more (stable) earnings. So, the pressure arising from debt markets to focus on immediate profits could decline. As an example, firms may then also initiate projects that produce higher earnings in later periods

rather than concentrate on projects that boost immediate profitability. In contrast to these arguments, when a large financial pressure just induces more highly leveraged business start-ups to maximize their current and future profitability, leverage could also have more long-lasting positive effects for firm performance.

The incentives of *rival firms* can also affect the leverage-performance relation when information asymmetries between a start-up firm and its lender(s) are large and when the start-up is highly dependent on the financing decisions of its bank. In industrial organization and corporate finance papers on this topic, a lot of attention has gone to the signal-jamming predation hypothesis, arguing that industry rivals may have incentives to distort the quality signals of firms to their financiers, for example through initiating a price war, if the expected payoff from such predatory behavior is positive for the predator. The predation literature has already pointed out that the payoff from predation is more likely to be positive when the prey is heavily indebted (e.g., Huyghebaert and Van de Gucht (2004)). As the likelihood of strategic interactions is larger when product markets are more highly concentrated, Franck and Huyghebaert (2008) examine whether the above positive relation between leverage on the one hand and profitability and growth in earnings on the other hand weakens with industry concentration. The reason is that the gains from strategic interactions are to be shared among fewer competitors in a highly concentrated industry. Also, as a first extension to Huyghebaert and Van de Gucht (2004), Franck and Huyghebaert (2008) investigate whether the effects of industry concentration differ across low and high-debt industries. Prior empirical research has documented that strategic interactions are especially important in industries where incumbent firms have relatively low debt ratios. Besides, when industry rivals themselves are highly leveraged, predatory actions, such as price wars, are more difficult to sustain over a long period. Finally, Franck and Huyghebaert (2008) analyze whether the effects of industry concentration on the leverage-performance relation become smaller as start-ups grow older, given that a longer operating and financial history reduces the information value of performance indicators in one particular year and given that the start-up becomes less dependent on external financiers over time. Then, industry rivals may cut back on their predatory activities. This research design again extends the study of Huyghebaert and Van de Gucht (2004).

To examine the effects of leverage on firm performance throughout the start-up years, Franck and Huyghebaert (2008) collect data on a unique and large sample of 12,489 Belgian business start-ups that were established between

1996 and 2003. These firms are followed during a five-year period following start-up and before December 2005. 17.29% of the start-up firms in the sample have left the sample by the age of six. Summary statistics highlight that surviving firms have significantly less debt outstanding than failing firms. Yet, the average ratio of total debt to total assets is still very high at 87.68% in the subsample of surviving firms, with a median value of 81.10%. Next, on average 36.90% of the assets of surviving firms are financed by means of bank debt, with the bulk contracted for a period longer than one year. Interestingly, although failing firms have significantly higher debt ratios than surviving firms, banks actually finance a significantly smaller fraction of total assets in failing firms. The other debt again largely consists of trade credit. Survivors have significantly more fixed tangible assets, whereas their capital expenditures are significantly larger, too. Not surprisingly, surviving firms significantly out-perform failing firms, both in terms of profitability and in terms of growth in earnings over time. The average ratio of EBITDA to total assets equals 18.85% for surviving firms and –9.72% for failing firms. Also, EBITDA on average grows by 18.05% per year for surviving firms and by 2.76% per year for failing firms.

Franck and Huyghebaert (2008) use a firm fixed-effects panel data specification to examine the relation between leverage and post-entry performance. Model (1) is used to test the financial pressure hypothesis, whereas Model (2) is used to test the predation hypothesis:

$$Performance_{i,t} = \beta_0 + \beta_1 * Leverage_{i,t-1} + \beta_2 * Leverage_{i,t-1} * Age_{i,t} + \beta_3 * Age_{i,t} + \beta_4 * Firmsize_{i,t} + \beta_5 * Investments_{i,t-1} + (\beta_6 * (EBITDA/TA)_{i,t-1}) + \alpha_i + \varepsilon_{i,t} \quad (1)$$

$$Performance_{i,t} = \beta_0 + \beta_1 * Leverage_{i,t-1} + \beta_2 * Leverage_{i,t-1} * HHI_{i,t} + \beta_3 * Leverage_{i,t-1} * HHI_{i,t} * Age_{i,t} + \beta_4 * HHI_{i,t} + \beta_5 * Age_{i,t} + \beta_6 * Firmsize_{i,t} + \beta_7 * Investments_{i,t-1} + (\beta_8 * (EBITDA/TA)_{i,t-1}) + \alpha_i + \varepsilon_{i,t} \quad (2)$$

The test variable, Leverage, is calculated as the ratio of long-term bank loans to total assets and is lagged during one year. This definition takes into account that 1) bank loans and trade credit are the sources of external funds upon which most business start-ups rely and 2) trade credit usually is short-term financing and largely fixed at the industry level. As a result, start-ups typically depend upon bank loans for their long-term financing of assets, operations and growth. To account for the fact that a firm's historical performance could have influenced its current debt ratio, i.e. a potential endogeneity problem, firm leverage is estimated as a function of asset tangibility – that is the ratio of fixed

tangible assets to total assets. This instrumental variable approach builds on the empirical work of Campello (2006), who argues that the liquidation value of firm assets is a good instrument for leverage. The reason is that asset tangibility is unrelated to firm performance. Yet, when banks incorporate the liquidation value of firm assets into their lending decisions, asset tangibility will greatly affect the firm's debt ratio. Firm age is included as a control variable, given that firm performance is likely to vary with age. Franck and Huyghebaert (2008) further use the log of total assets and the lagged value of capital expenditures relative to fixed tangible assets as control variables. Besides, they include the sales-based Herfindahl-Hirschman concentration index, measured in the corresponding five-digit NACE industry. Finally, when considering the EBITDA growth rate as the dependent variable, the lagged value of the ratio of EBITDA to total assets is included as another control variable.

The models are estimated using Estimated Generalized Least Squares, to make adjustments for serial correlation and heteroskedasticity so that the error terms in the model are IID. In addition to estimating the above models in absolute terms, Franck and Huyghebaert (2008) also run the models in relative-to-rival terms. The reason is that industry characteristics, such as entry barriers, economies of scale, or market structure, can affect leverage as well as post-entry performance, for instance through the impact of competition. To implement these relative-to-rival regressions, the data are standardized at the corresponding five-digit NACE industry level. Finally, Franck and Huyghebaert account for the fact that a substantial percentage of start-up firms leave the sample in the first few years after start-up, thereby potentially inducing an attrition bias. For this purpose, they use a two-step procedure where annual inverse Mills ratios are calculated based on year-by-year failure regressions, to test the robustness of their findings.

In support of the financial pressure hypothesis, the data reveal that business start-ups with higher leverage in one year report a higher ratio of EBITDA to total assets in the subsequent year. Also, more highly indebted business start-ups exhibit higher growth in earnings, as captured by their EBITDA growth rate. This positive effect of leverage on firm profitability and growth in earnings is robust to also including short-term bank loans in the definition of leverage. It continues to hold when firm performance and the explanatory variables are standardized at the corresponding five-digit NACE industry level. Lastly, it is also robust to correcting for a potential attrition bias. From interacting leverage with firm age, Franck and Huyghebaert (2008) conclude that the positive effect of leverage on the ratio of EBITDA to total assets increases as start-ups grow older. In contrast, the positive influence

of leverage on the EBITDA growth rate diminishes as newly established ventures mature. Overall, these findings do not support the idea that the pressure arising from debt markets becomes smaller once firms establish an operating and financial history. Rather, the data reveal that leverage has more long-lasting positive effects on firm performance. Indeed, when entrepreneurs in highly indebted business start-ups are maximizing the performance of their firm, the rate at which they are able to further improve profitability is likely to decline with firm age.

To test the predation hypothesis, Franck and Huyghebaert (2008) separately run their regression models for firms in low-debt industries and firms in high-debt industries, respectively. They use the sales-weighted industry debt ratio, again calculated as the ratio of long-term bank loans relative to total assets, to capture the overall indebtedness of industry incumbents. The sample is subsequently split into two subsamples, using the median value of this industry debt ratio. For high-debt industries, the empirical results reveal that the interaction term between leverage and the HHI concentration index is (marginally) significant, but positive. A positive coefficient on this interaction variable thus indicates that in high-debt industries, high-debt business start-ups outperform low-debt entrepreneurial ventures when the industry is highly concentrated and, thus, the number of rival firms is limited. Hence, this finding suggests that high-debt business start-ups are not targeted by rival predatory actions when industry rivals themselves are highly leveraged. What's more, the data even point out that a lack of competition in product markets further strengthens the positive relation between leverage and post-entry performance for highly leveraged business start-ups, thereby suggesting that leverage can still incentivize entrepreneurs when disciplining from product markets is largely lacking.

For low-debt industries, the empirical results point out that the interaction term between leverage and the HHI concentration index is significantly negative. Under the assumption that the intensity of strategic interactions is stronger in low-debt industries, the negative effect of leverage times industry concentration n firm performance in low-debt industries suggests that highly indebted business start-ups find it more difficult to realize high profitability and growth in EBITDA over time when the odds of rival predatory actions are larger. Furthermore, the negative effects of industry concentration for high-debt ventures in low-debt industries decline as start-ups grow older, again consistent with the predation hypothesis.

Overall, the above results refine earlier findings by Huyghebaert and Van de Gucht (2004). The latter authors show that entrepreneurial business start-ups in highly competitive industries are more likely to exit and that firm leverage compounds this failure risk. Huyghebaert and Van de Gucht (2004) do not consider the role of the debt ratio of industry incumbents, however. Yet, they do point out that start-up leverage negatively affects firm survival only when potential adverse selection and moral hazard problems in financial markets are considerable at the moment of start-up. Under these circumstances, competitors can use aggressive strategic actions to impede future financing by negatively influencing creditors' perceptions on entrepreneurial quality and/or firm behavior (e.g., expropriation). By adjusting their output or price in response to new firm entry, incumbent firms can negatively impact the cash flows of business start-ups, which could make financiers reluctant or unwilling to grant subsequent financing or roll over existing short-term debt contracts. In other words, incumbent strategic behaviour in the product market can further induce the exit of newly established entrepreneurial ventures through its impact on the financial markets so that firms are denied financial capital.

4. Conclusions

This paper argues that the capital structure of business start-ups is an endogenous result, where entrepreneurs as well as financiers try to maximize their utility. Entrepreneurs are concerned about firm survival, especially when they highly value private benefits of control. Banks wish to reduce their exposure to information and incentive problems. The outcome of this joint optimizing behavior is important, as it has implications for firm performance, growth and survival. On the one hand, entrepreneurs in highly indebted new ventures face stronger pressure from debt markets to increase post-entry performance in order to reduce the likelihood of adverse credit decisions and firm liquidation. The idea that leverage can improve firm performance is not new. It has long been recognized by researchers in corporate finance as a mechanism to reduce firm free cash flows and thus avoid over-investment in projects with a negative net present value. So, Franck and Huyghebaert (2008) point out that leverage has more general positive implications for firm performance that go beyond the reduction of managerial self-serving behavior,

as the incentives of the entrepreneurs in this sample are generally aligned with the maximization of shareholder value. Next, while the positive effects of leverage on profitability increase as start-ups grow older, the positive effects of leverage on growth in earnings decline with start-up age. Together, these findings indicate that highly indebted business start-ups continue to hold a strong focus on profit maximization as time goes by, so that their ability to realize further increases in earnings actually declines as firms grow older.

Besides, the results of Huyghebaert and Van de Gucht (2004) and Franck and Huyghebaert (2008) point out that business start-ups may suffer from predation, especially in low-debt industries. Indeed, industry concentration tends to reduce the positive effects of leverage on post-entry performance (profitability and growth in earnings over time). Yet, this negative influence of industry concentration becomes smaller as start-ups grow older. Arguably, these results are consistent with the idea that information asymmetries between business start-ups and their bank incite rival firms to distort a start-up's quality signals, being its earnings to its bank. Simultaneously, these results point out that predation is more likely to occur when rival firms can endure the adverse consequences of predatory actions for their own profitability and the benefits from predation are to be shared among only a limited number of industry incumbents. When information asymmetries between the start-up firm and its bank diminish over time, these effects decline too, consistent with the idea that low performance in one year is less likely to lead to adverse lending decisions by banks when the banking relationship has grown stronger and firms have easier access to other financing sources.

Arguably, these findings have implications for public policy. First, they suggest that in the start-up context, bank loans are an effective tool to force firms to maximize profitability, despite the fact that agency problems of equity are trivial because of high ownership concentration. Second, the results suggest that when the likelihood of predation is larger, highly indebted business start-ups are more likely to suffer. For these firms, having a low debt ratio is the optimal response to a stronger predatory threat, whereas high leverage is the best option for firms that face a low likelihood of rival predation.

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3. FINANCE FOR INNOVATION AND GROWTH

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1. Introduction

We are living a period of financial and economic crisis. It is accompanied by widespread pessimism and lack of confidence and trust. Under the circumstances it may appear out of place to focus on long run growth and innovation. Before addressing the topic of this Lecture I want to argue against such a perspective. In my view it is precisely in moments of crisis and turmoil that it is important to take a long run perspective.

Angus Maddison[1], among others, documents that from the earliest period on record up to the eighteenth century, the standards of living have been quite stable over the long run. Sharp variations in standards of living were associated with disease, famine and war. Nevertheless, they would not persist over the very long run. The Malthus / Ricardo model was able to reconcile long run stable standards of living with technological progress over time.[2] The Malthusian curse, that earned Economics the epithet "dismal science", was

[1] Maddison, Angus: www.ggdc.net/maddison/

[2] See Lucas (2002).

broken sometime in the 18th century. Technological progress paced-up and a demographic transition led to a sharp slowdown in population. Demographic transition is compatible with an increased value of human capital.

In a recent paper with Gabriel Fagan and Peter McAdam, I have explored a mechanism for endogenous accumulation of knowledge proposed by Immanuel Kant in 1784[3]. For Kant all progress starts from an idea in the mind of an individual. Individual effort depends on rivalry and competition. It relies also on co-operation. For example knowledge accumulates slowly (paraphrasing Kant each generation must educate the next). Kant's mechanism can be seen as in line with much of modern endogenous growth literature.

Kant also emphasized the importance of a well-ordered society in order to channel individual effort to activities leading to progress. Kant's mechanism is, in my view, fully in line with the contemporary analysis by Douglas North[4], who interprets the emergence of a rule of law protecting private property as a solution to a problem of commitment on the part of the sovereign. Specifically, the rule of law and primacy of private property emerged, in Europe, as a solution to the problem of how to ensure the availability of debt financing in the event of a war. Clearly if the sovereign were not constrained by any legal limits then it could not credibly promise to repay the debt: since it could always renege on promises *ex post*. The rule of law appears as one solution to a severe time-inconsistency problem affecting action on the part of the sovereign. Private property rights, in turn, are essential for enduring effort leading to progress. Similar points may be made on the basis of contributions as diverse as those of Max Weber, Joseph Schumpeter and John Hicks[5].

The engine of growth is a capitalist society based on competition and change. Joseph Schumpeter characterizes economic development as: "The spontaneous and discontinuous change […] which forever disturbs the equilibrium state that previously existed".[6]

Nobel Prize winner Robert Solow[7] showed that for a sustained economic growth technological progress is more important than factor accumulation. For Schumpeter behind innovation (i.e. the economic application of technological improvements) lies entrepreneurship. Innovation involves the industrial or

[3] Fagan et al. (2008).

[4] North (1993).

[5] Weber (1927); Schumpeter (1934); Hicks (1969).

[6] Schumpeter (1934).

[7] Solow (1957).

commercial use of something new: a new good or service, a new production method, a new market or source of supply, a new form of organization or a new method of financial organization. For Schumpeter innovation is fraught with difficulties. One of them stems from the need for external financing (see Levine (2005) for a recent review of the literature on finance and growth, as well as Aghion and Howitt (2005)).

The rest of the Lecture is organized as follows. In section 2 we will look at the growth performance of the EU from a Schumpeterian perspective. We will emphasize the importance of Young Innovative Companies (YICs). In section 3 we will look at the evidence on the importance of financing constraints for YICs. We will be drawing on research in progress by Schneider and Veugelers (2008). Finally we will conclude.

2. A Schumpeterian look at the growth performance of the EU

After a long period of technological catch-up since the WWII, the productivity gap between Europe and the US began widening again in 1995. Structural conditions necessary for Europe to catch-up with the productivity leader, the US, were present from the end of the war to the first oil shock and afterwards. However, conditions needed for creation, innovation and leadership in a knowledge economy worked against Europe (relative to the US) in the more recent period.

The recovery of the US productivity growth in the post-1995 period, and the corresponding decline in the EU reflects the influence of key technology and policy factors. We discuss three interrelated determinants: ICT (information and communication technology), innovation and firm dynamics.

The role of ICT as a general purpose technology in EU productivity growth

Sectoral data suggest that the divergence in productivity growth between the US and the EU in the post-1995 period is primarily explained by differences in the pattern of production and use of ICT (O'Mahoney and Van Ark (2003)).

- Labour productivity growth in **ICT producing manufacturing** industries has been particularly high in both the US and the EU. However, the US benefited from a leading initial position and an increasing growth in the post-1995 period in high-tech industries such as office machinery, electronic valves & tubes, telecom equipment, TVs, and scientific instruments.

- **ICT using services** have been the focus of the most profound technological gap with the US, particularly in the retail and wholesale sectors and in banking and finance. On the other hand, more restrictive regulatory barriers in European countries have been detrimental to the diffusion of ICT.

More recent firm level evidence (Bloom et al. (2007)) confirms that the US productivity advantage is not only related to a higher ICT spending by US firms (in ICT using sectors). In addition, US firms as well as their subsidiaries operating outside the US-specific conditions reap a higher return from their ICT investments. This suggests that other firm-specific advantages are important, such as the quality of management practices (Bloom and Van Reenen (2007)).

The importance of knowledge production and diffusion

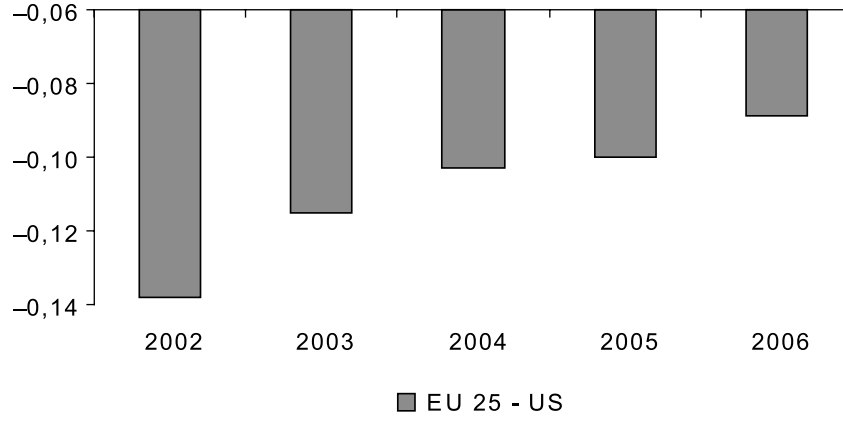
In the present context one needs to define the extent to which the example of ICT is an isolated case or is likely to be replicated in other high-growth, high-tech industries[8].

Assuming that a failure of EU enterprises to recapture the full potential and benefits related to ICT is a credible risk, the following key questions arise: (1) Does the EU have specific problems regarding its innovation infrastructure?; (2) Does the US have specific features/framework conditions which make it more likely to be the locus for the next future breakthroughs in technology?; (3) Why is the EU less apt to creating and exploiting new technologies

[8] This is a pertinent question if one accepts the contention of Gordon (2004), amongst others, that the US's lead in ICT is not an isolated case.

in general? In order to better understand the EU–US innovation deficit, discussion beyond ICT importance is needed.

Figure 1: EU's overall innovation performance relative to the US



EIS uses a composite indicator to assess Innovation (various innovation input and output measures)

Source: EIS 2006.

Despite some signs of catching-up, Figure 1 confirms the presence of persistent innovation deficit in the EU. As this innovation indicator comprises several innovation input and output measures, the EU innovation gap goes beyond the deficit in R&D spending. The R&D deficit is a symptom rather than a cause of a weakness in the EU's capacity to innovate; the cause is rooted in the structure and dynamics of industry and enterprise (O'Sullivan (2007)).

A comparison of innovation inputs shows that SMEs represent a larger share of **R&D expenditures** in the EU than in the US and Japan.On the other hand, EU SMEs are less R&D intensive than in the US, although the SME gap is similar to the overall gap in R&D spending. The average R&D intensity of SMEs in Europe is 0.34% versus 0.53% in the US. This compares to an overall average R&D intensity in Europe of 1.17% versus 1.57% in the US.[9]

However, specific contribution of SMEs to innovation goes beyond the share of SMEs in R&D expenditures or in innovation output. SMEs have a very important indirect effect. Usually young small innovating firms create radical new technologies and markets, whose further developments are completed by large players. Baumol (2002) recognizes the complementarity between small

[9] Results are based on DG RTD (2007).

and large firms, but at the same time notes the importance of small firms in large innovations.[10] According to Baumol, private sector innovations in the US come from two distinct sources, firstly from the activities of large firms and secondly from the efforts of independent inventors and their entrepreneurial partners. Baumol asserts that the active presence of both groups enhances the overall innovation process since their activities are complementary. Independent inventors/entrepreneurs specialise in breakthrough innovations while R&D departments of the larger firms enhance these breakthroughs and add to their overall usefulness.

Firm demography and the creative destruction process in Europe

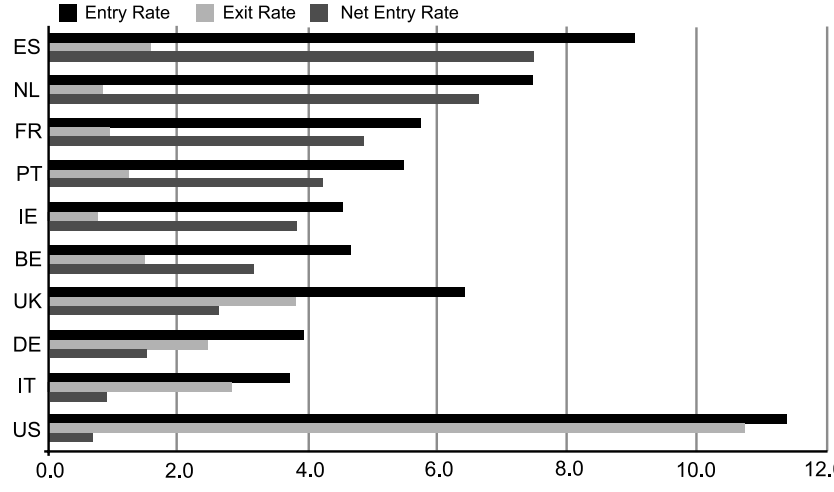
EU-US productivity growth differences can be additionally explained by (a change in) firm demography (Bartelsman et al. (2004)). The **churning process** has substantial effects on labour productivity growth because large part of it results from reallocations from less productive to more productive firms. Industries and/or countries where the churning process is inhibited, exhibit lower productivity and employment rates.

All European industries exhibit a greater number of **small firms** and also a higher share in total employment than in the US. American manufacturing firms are larger and they display wider size dispersion, particularly in high-tech sectors and in wholesale and retail.

Figure 2 on aggregate entry, exit and net entry rates from the research work of Cincera and Galgau (2005) shows that although both **entry and exit rates** are lower in the EU than in the US, the differences in exit rates are substantially larger. The average **size of entrants** is much smaller in the US. **Lower entry as well as lower exit (firing) costs** in the US allow benefiting from the experimentation process supplied by the market (Poschke (2006)). While there is a high **positive correlation between the entry and exit** in the US, correlation is insignificant in the EU and even negative in France, Italy and Portugal. A positive correlation reflects churning of firms within sectors as a part of the creative destruction process. A negative correlation reflects more traditional sectoral shocks (positive for entry, negative for exit).

[10] In 1994 the Small Business Administration Office of Advocacy prepared a list of breakthrough innovations made by small firms during the 20th century (reported in Baumol, (2002)). It is impressive going literally from A (airplane) to Z (zipper) with many innovations that have been crucial to the economy. Other studies on the distribution of innovations certified as "significant" by industry experts, confirmed that small (as well as large) firms outperform medium-sized firms for the US (see OECD (2006) for an overview).

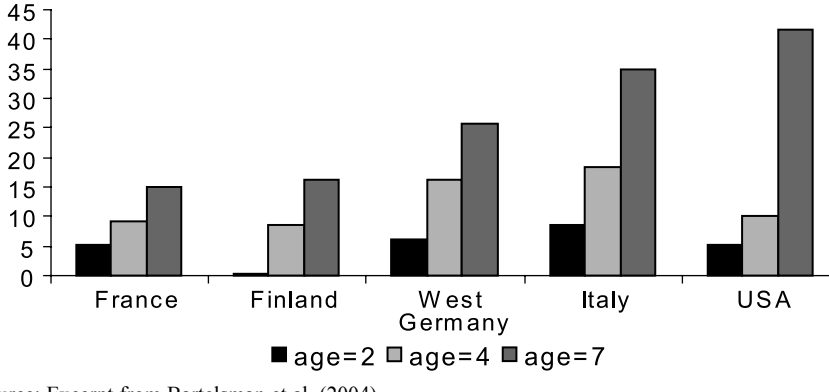
Figure 2: Aggregate entry, exit and net entry rates (in %) by country (1997–2003)



Source: "Impact of Market Entry and Exit on EU Productivity Growth Performance", M. Cincera and O. Galgau (2005), EC Economic Papers 222.

Post entry performance also differs between Europe and the US as shown in Figure 3 on net employment gains amongst surviving firms at different limits from the empirical research of Bartelsman et al. (2004). The short term survival rate (2 years) for American entrants is very low, but after this market experimentation period, the conditional survival rate of successful firms becomes high. In addition, the growth for firms that survive for 7 years is higher in the US than in Europe. These results are a clear indication that there are also higher barriers to growth for SMEs in Europe.

Figure 3: Net employment gains among surviving firms at different lifetimes (net gains as a ratio of initial employment)



Source: Excerpt from Bartelsman et al. (2004).

2.1. The impact of the creative process on productivity growth

The overall labour productivity growth originates mainly in growth of incumbent firms, both in the US and the European manufacturing sector. However, the EU-US differential growth performance can be explained by the reallocation effect between firms and the net entry component. This seems to be a clear indication that creative destruction process is less effective in European countries than in the US in both low and high tech industries.

- The **exit effect** is always positive, both in the US and the EU, which means that exiting firms are the least productive firms.

- The long-run **effect of entry** on aggregate manufacturing productivity growth has a smaller magnitude in the EU than in the US (Bartelsman et al. (2004)). Furthermore, Aghion et al. (2003) show that the effect of entry depends on the industry's distance to the technology frontier. The positive effect of entry on productivity growth is more significant the closer a country or sector is to the technological frontier.

- In high-tech sectors, the entry effect is positive in all countries and this suggests an important role for new firms in more **technology intensive industries**. In these industries, the entry effect is much stronger in the US than in the European countries. Similar observations apply to exit barriers.

- New and small firms contribute to aggregate productivity growth directly through their own growth performance, and indirectly by affecting growth of large incumbents. Thus, the **US firms' post-entry growth** and productivity performance is higher. Moreover, beneficial interactions between small and large firms, especially in sectors where technical ideas and innovations are an important ingredient of growth, could be at the heart of different effects that entry has on aggregate productivity growth.

In summary, Europe's growth gap results partly from an inappropriate industrial structure in which small and new firms, occupying the main part of total employment, fail to play a significant role in the dynamics of the industry, especially in the high-tech intensive sectors. This is illustrated by their inability to enter, but most importantly, for the most efficient innovative entrants, to grow. The churning that characterizes the creative destruction process in a knowledge based economy encounters significant obstacles in the

EU, suggesting barriers to growth for small innovating firms which ultimately weakens Europe's growth potential.

Economic analysis suggests the following "problem drivers" for the insufficient exit and low post-entry growth:

- weaker product market competition (e.g. barriers to cross- border trade in services, national regulations, etc);
- protection of inefficient firms through subsidies, bail-outs, etc.;
- labour market and other regulations that kick in when a firm grows beyond a certain size threshold;
- financial market developments.

3. Financing of small and young innovative companies

The literature generally supports the importance of new, young and therefore often still small firms for innovations and growth, even if they are small in number. Therefore, factors that would inhibit these small, young companies to innovate and grow can have a huge public impact.

In the analysis of the (failing) contribution of small and young firms to innovation and growth, **access to finance** is a priority issue. Survey data for the EU confirm the importance of **access to finance.** Excessively high economic risks are the major hampering factors for innovation for all types of firms, but somewhat more for small than for large firms. A second tier of barriers is formed by the **access to skills**, which again impedes both small as well as large firms. **Regulatory burden is also included** in the second tier of barriers. The empirical evidence suggests that this burden is somewhat stronger for small firms.

Table 1: Proportion of enterprises that regard selected hampering factors as highly important (% of all enterprises); by size class

	Excessive perceived economic risks	Innovation costs too high	Lack of appropriate sources of finance	Organisational rigidities within the enterprise	Lack of qualified personnel	Lack of information on technology	Lack of information on markets	Insufficient flexibility of regulations or standards	Lack of customer responsiveness to new goods or services
Small	16	21	16	6	13	5	5	10	8
Medium-sized	13	19	13	5	14	4	4	8	6
Large	18	21	10	6	13	3	4	7	5

Source: Eurostat (2004).

Analysis of survey data on firms' financial constraints perceptions show that age of the firm, which reflects its reputation, is more important than its size in determining the degree to which the firm feels financially constrained. A possible interpretation of this result is that age might reflect reputation of the firm which, in turn, significantly affects access to finance [see BEPA (2008)].

The access to finance barrier can be associated with a **market failure**. Risk and informational asymmetries create capital market imperfections, and a firm's lack of reputation and collateral become crucial elements. Existing literature

demonstrates substantial differences between small and large firms in this respect. Hall (2005) shows that imperfections in capital markets usually affect small firms more than large ones which can rely on internal financing. With, Young firms are even more likely to be constrained than other small firms as reputation and collateral are important to mitigate capital market imperfections. More radical investment projects further exacerbate the imperfect, incomplete and asymmetric information problem. Thus, young innovative companies, which combine the disadvantages of a small scale, a short history, less retained earnings and more risky innovative projects, are even more likely to be financially constrained than other small or young or innovating firms.

Along with this financial market failure, particular for the **EU**, stands the highly **fragmented** nature of its venture capital market with 27 different operating environments adversely affecting both fundraising and investing. Complexity in operating across borders means that some funds have difficulties in expanding, growing and reaching a critical mass. This makes access to financing even more difficult and more expensive in the EU.

Financing of young innovative companies in the EU: some empirical evidence from West Germany

Despite the high policy relevance, surprisingly little empirical evidence exists to support the failing contribution of small entrepreneurial companies to innovative performance in Europe. We present main findings of a recent interesting and relevant work produced internally and co-authored by a researcher from the Catholic University of Leuven. Schneider and Veugelers (2008) provide some empirical evidence on the innovative performance of young, small innovative companies (YICs), using firm level evidence from Germany, i.e., the 2005 wave of the German Community Innovation Survey (CIS 4). This data set allows the authors to:

(i) identify YICs for Germany on the characteristics of size, age and innovation profile;

(ii) characterize whether YICs are more constrained by barriers for innovation and econometrically investigate whether YICs are more constrained by access to finance than other innovators;

(iii) econometrically investigate whether YICs are indeed more likely to be innovation performing, and particularly more likely to introduce radical innovations.

3.1. Characterizing YICs

The authors follow the recently revised European Commission's State Aid rules to characterize **YIC**s[11] which allows a more favourable treatment of national governments to provide R&D subsidies and tax incentives to YICs. The *YIC* dummy takes a value of 1 if an innovation active company is less than 6 years old, has less than 250 employees and spends at least 15% of its revenues on R&D.

Out of their sample of 1342 German innovation-active companies, only 51 companies qualify for YIC status, using our EU State Aid definition. This confirms the "rareness" of YICs, representing only 3.8% of all innovation-active companies in West-Germany in 2005. Even within the group of small innovators or young innovators, YICs are rare (4.3% and 24%, respectively).

A "typical" YIC has a micro size, with about 20 employees. This is considerably smaller than other innovating SMEs, as well as young innovators. Also on R&D intensity and basicness of its R&D profile, a "typical" YIC scores much higher than any of these reference categories. These statistics confirm that it is a combination of age, size and R&D profile that composes the particularity of YICs. YICs are not the same as innovative SMEs or young innovators. Finally, YICs are overrepresented in knowledge-intensive, technological sectors, specifically services (ICT and R&D engineering) while they are absent in more traditional manufacturing industries.

3.2. YICs and barriers to innovation

Table 2 presents the results on whether YICs perceive differently obstacles to innovation. Respondents were asked to give a score to each (potential) hampering factor on a scale going from zero (not relevant) to three (high). The first column indicates the share of firms that considered this factor to be relevant (i.e. firms that scored one or more), while the second column reports the mean score.

[11] Young Innovative Companies are defined in the EU State Aid Rules as small Enterprises, less than 6 years old, having being "certified" by external experts on the basis of a business plan, as capable of developing products or processes which are technologically new or substantially improved and which carry a risk of technological or commercial failure, or have R&D intensity of at least 15% in the last three years or currently (for start-ups).

Table 2: Obstacles to innovation

	YICs		Other Innovators		
Barriers to innovation	%	mean score	%	Mean score	mean diff. with YICs
External financial constraints	95.65%	2.283	75.75%	1.234	–1.049***
Internal financial constraints	93.30%	2.457	66.42%	1.382	–1.074***
Innovation costs too high	93.33%	2.356	87.71%	1.862	–0.493***

Source: Schneider and Veugelers (2008)

As expected, YICs face, on average, higher obstacles to innovation than other innovating firms. When comparing across barriers, results confirm the presumption that financial constraints (both internal and external) are the most important barriers to innovation for YICs. Although this ranking also holds for other innovating firms, the YIC-differential is the largest and strongly statistically significant on both financial constraints.

For internal and external financial constraints, a YICs differential effect survives an econometric analysis, correcting for other firm and industry characteristics. Table 3 provides results from an ordered probit model to explain the importance of access to finance (internal and external) as a barrier to innovation. Results confirm that small innovators are more likely to be financially constrained (both internally and externally), and so are innovators that have a more basic innovative profile. Furthermore, YICs are significantly more likely to be financially constrained. These results therefore support the case for public policy attention to access to finance for YICs.

Table 3: Econometric evidence on YICs and financial constraints

	Internal financial Constraints			External financial Constraints		
Variables	Coef.		S.D.	Coef.		S.D.
log(age)	–0.009		0.034	–0.017		0.035
log(employment)	–0.106	***	0.019	–0.150	***	0.019
R&D intensity	0.246		0.203	0.292		0.207
YICs	0.780	***	0.206	0.516	***	0.200
Basic R&D reliance	0.175	**	0.077	0.191	**	0.078
Industry dummies	Included			Included		
Threshold 1	–0.896		0.238	–1.052		0.242
Threshold 2	0.010		0.237	–0.282		0.241
Threshold 3	0.745		0.238	0.345		0.241
Log-likelihood	–1652.010			–1620.057		
Number of observations	1250			1246		

Source: Schneider and Veugelers (2008)

To summarize, the evidence presented in Schneider and Veugelers (2008) show that Young Innovative Companies, combining newness, smallness and high R&D intensity, are rare in the sample of innovative firms. They view financial constraints, both internal and external, as an important factor hampering their innovation activities, significantly more so than other innovation active firms.

4. Conclusions

We have argued that innovation is an important determinant of competitiveness and important to address global challenges, such as sustainable development. The importance of innovation has been reinforced by a fast development of new technologies (ICTs in particular), which enabled new forms of competition and opened new markets for creation of innovative products. Nevertheless, despite importance of innovation, as well as new opportunities offered by globalisation and new technologies, improvement in productivity in the EU, the EU seems to be lagging behind the US in this area.

We try to document the importance of SMEs and young innovative companies (YICs) for innovation process. Both of them are source of dynamism and in particular, YICs are directly related with research activities and are a key component of the innovation system, facilitating the emergence of new products and markets. However, evidence shows that in Europe small and new firms fail to play a significant role in the dynamics of the industry, although they account for a majority of employment. Not only they face significant entry barriers, but also successful entrants face difficulties to grow.

However, the ability of SMEs to grow depends highly on their potential to invest in restructuring, innovation and qualification. All of these investments require capital and therefore access to finance. Recent policy initiatives, such as the creation of the YICs status at the European level, aim at improving the financial environment for European entrepreneurial activity and more specifically to support newly-founded innovative firms in order to increase their global competitiveness and spur innovation.

Empirical research on access to finance for SMEs and young innovative companies has been limited, however, a recent analysis supported by German CIS data, confirms the presumption that young, small, innovation-intensive firms are a very small but distinct segment in the group of innovative companies. Furthermore, access to finance is the most important factor that hampers YICs' innovation activities, significantly more than other innovating firms.

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4. SME FINANCING IN EUROPE: MEASURES TO IMPROVE THE RATING CULTURE UNDER THE NEW BANKING RULES

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1. Introduction

It is widely accepted that the SME sector plays a central role in promoting employment, growth and innovation in Europe. Therefore, it is very important to ensure that financing conditions for SMEs are not overly tight because of more stringent capital rules, particularly when they already have difficulties in accessing finance in capital markets given their limited size and reputation.

SMEs in a number of EU countries have expressed concerns about the likely impact that the European version of the new Basel Capital Accord (Basel II) and the Capital Requirements Directive (CRD) could have on their access to credit and the related costs that this may entail. In this context it is useful to start with a brief history of the treatment of SME financing under Basel II.

In July 2002, the Basel Committee agreed to grant loans to SMEs under a special and more favourable treatment framework. According to the current Basel II and CRD proposals, SME funding by the banks using either the standardised or internal ratings-based (IRB) approach will in general be given a lower capital requirement than loans to larger firms. The capital savings, which may be as high as 20%, result from the application of a reduction

mechanism (discount factor) that corrects the asset risk weights on the basis of the borrower's size.[1] By allowing this special regime, the Basel Committee finally put an end to the long and heated debate that had flared up, particularly across Europe, after the release of the second consultation paper in January 2001.

In theory, the SMEs' concerns should have disappeared after they were accorded this preferential regulatory capital treatment. In practice, however, the new Capital Accord has introduced a very risk-selective approach: indeed, the more risk a borrower entails, the higher the capital charge will be. In other words, an SME that has a good business plan but inadequate equity and volatile cash-flows will accrue a higher cost of credit.

These concerns still have some foundation, as little is known about the immediate implications of new regulations when they are first introduced. These concerns may be alleviated, however, by becoming informed about the new regulation, its likely implications and the way in which banks will use internal rating systems to assess SME creditworthiness.

This paper discusses the main characteristics of SME financing in Europe and provides an analysis of the impact of Basel II on SMEs credit financing conditions. Finally, it concludes with the key measures that should be taken by banks and SMEs and public policy-makers to improve SME financing in the new rating culture.

[1] The firm-size adjustment factor is an algorithm that modifies the asset correlation in reverse proportion to the SME's size.

2. Sources of SME financing in Europe

Financing an SME generally depends on its sector of activity and its growth cycle.[2] In order to grow, a firm needs to be able to rely on equity and debt. Thus SMEs have a financial growth cycle in which financial needs and options change as the business grows and becomes more transparent.

Figure 1 shows this cycle in a stylised fashion, whereby firms lie on a size/age/information continuum. It seeks to give a general idea of which sources of finance become important at different stages in the financial growth cycle and the points in the cycle at which different types of funding are shown to begin and end.

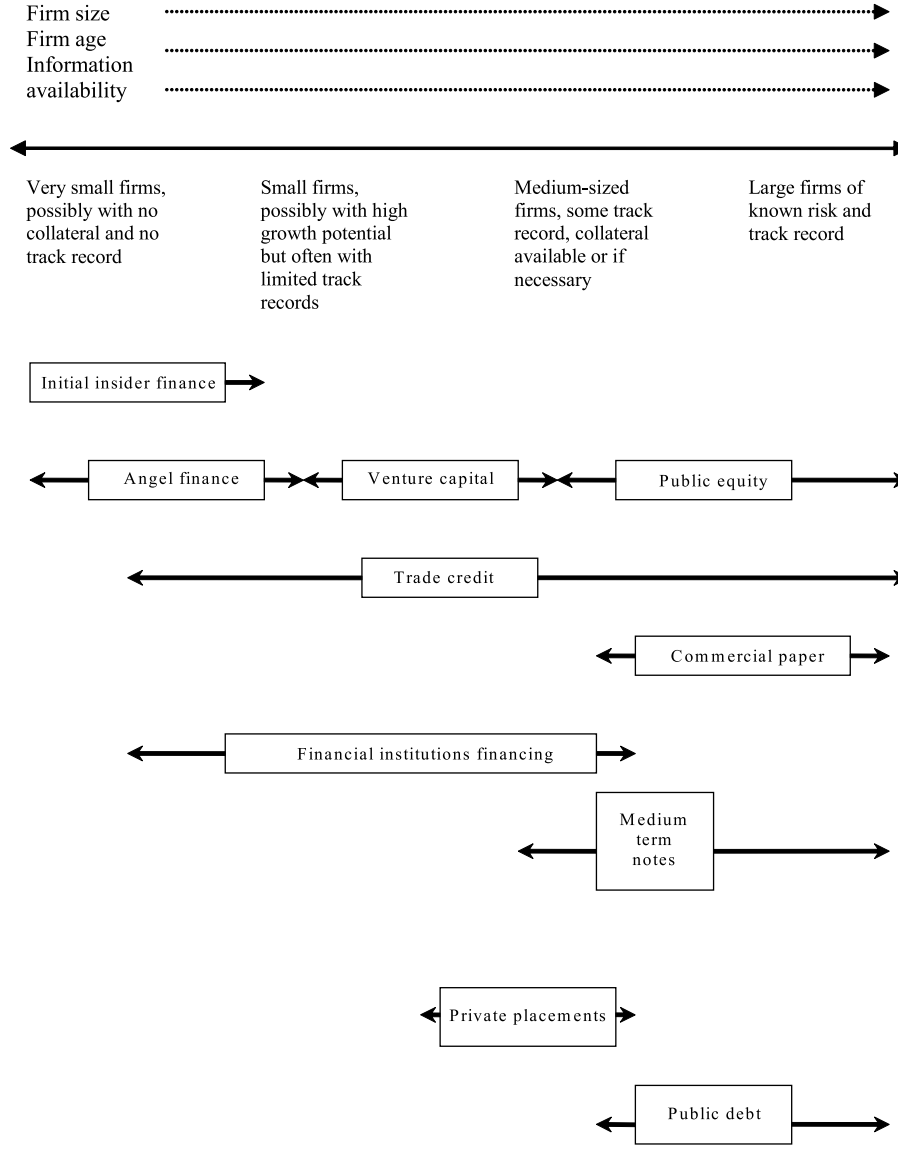
At the beginning of the growth cycle, the financing of smaller and younger firms is heavily dependent on initial **insider finance** (equity) and external investors through, for example, **angel financing**.[3] (At this stage, these firms are an unknown quantity because they do not yet have a track record and therefore have much difficulty in accessing intermediated external finance.) Insider finance or equity is defined as funds provided by the start-up team, family or friends prior to and at the time of the firm's inception. Angel financing is an informal, non-intermediated market for direct finance where 'angels', who are by definition high net-worth individuals, invest directly in small companies through an equity contract, typically common stock. Angels sometimes work as a small investment group in which they coordinate their investment activities.[4] Sometimes this is done in conjunction with lawyers and accountants, who bring deal flair to the group and help structure the contracts.

[2] See Berger & Udell (1998).

[3] See Sahlman (1990) and Wetzel (1994).

[4] See Prowse (1998).

Figure 1. Firm continuum and sources of finance



Source: Berger & Udell (1998).

As firms grow, they gain access to intermediated finance on the equity side through **venture capital,** for example, and on the debt side through financial institutions and supplier credit. Venture capital (and trade credit) could typically come after the product or service has been successfully tested by

the market and may be used to finance full-scale marketing and production. Eventually, if the firms survive and grow, they may access public equity and debt markets.

Trade (or supplier) credit is the credit the supplier gives to his client in a business-to-business relationship. Instead of paying for the goods and services rapidly in cash, the firm makes delayed payments to its suppliers, which creates the equivalent of a loan from the suppliers to the firm. The use of supplier credit depends on the length of payment period, the availability of the supplier's own funds and also access to bank loans.

Suppliers are generally reluctant to grant trade credit to start-ups because of the lack of information about the firm and the higher probability of default. When companies grow and show stable cash-flows, trade credit becomes a viable and frequently used source of financing.

As firms continue to grow and achieve a level of production whereby their balance sheets reflect substantial, tangible business assets that could be pledged as collaterals and guarantees, they can tap other sources to obtain debt financing. Commercial, cooperative and savings banks, specialised finance companies and other financial institutions together provide most of the external debt finance.

Financial institutions provide two types of credit to SMEs: i) credit cards and credit lines,[5] and ii) mortgage loans,[6] equipment loans, motor vehicle loans, capital leases[7] and other types of loans. The former are typically used to finance working capital needs and are often collateralised by assets unrelated to the use of the credit line. Indeed, they could be guaranteed by one or more insider owners, which gives the financial institution the possibility of recourse to the personal wealth of the owners in the event the loan is not repaid. In many cases, the personal assets of the owners are explicitly pledged as collateral to back the loans (see Box 1). The latter are typically used to finance specific assets and are collateralised by the assets being financed

[5] The credit lines represent a loan commitment by the financial institution to provide future credit (these commitments may include short-term credit including overdrafts and long-term credit).

[6] Mortgages include both commercial and residential mortgages if the funds were used for business purposes. They may be secured by either commercial property or the personal property of the owner.

[7] For most equipment loans, motor vehicle loans and capital leases, the proceeds of the loan or lease are used to purchase the assets pledged as collateral.

(commonly known as 'asset-based financing') such as accounts receivable, inventory and equipment.

Box 1. Differences between collaterals and guarantees

Collaterals and guarantees are powerful tools that allow the financial institutions to offer credit on favourable terms (since the collateral itself reduces the risk of the loan) and also to proceed to recovery in the event that the borrower is defaulting on his or her payments. Indeed, providing collateral or a guarantee is not only a pledge against default for the financial institution, but it is also a tool to reduce the informational opacity of small businesses. The lack of information might result in credit rationing or the extension of credit only on relatively unfavourable terms.

There are two types of collateral: the collateral that involves pledged assets owned by the firms (these may include accounts receivable and/or inventory, referred to as 'asset-based lending') and the collateral that involve pledging assets owned outside the firm, typically assets belonging to the firm's owners. The monitoring of receivables and inventory may also produce valuable information about a firm's future performance as well as information about the value of the collateral, which can be used as part of an overall relationship that may lead to more favourable credit terms in the future.

Guarantees give the lender general recourse against the assets of the principle owner or other party issuing the guarantee. A guarantee is similar to a pledge of outside personal collateral, but it differs in two important ways. First, it is a broader claim than the pledge of personal collateral since the liability of the guarantor is not limited to any specific asset. Second, a guarantee is a weaker claim than a pledge of collateral, against any given set of assets since a guarantee does not involve specific terms that prevent these assets from being sold or consumed.

Specialised finance companies also play a key role in providing debt financing to SMEs.

Leasing involves a lease contract, i.e. an agreement between the owner of the asset, 'the lessor', and the user of the asset, the 'lessee', which conveys to the user the right to use the asset in return for a number of specified payments over the agreed period of time. Leasing is simply a way of acquiring an asset without paying cash, taking out a loan or using other forms of financing. For many SMEs, leasing is attractive because it frees up cash that would otherwise be tied up in fixed assets and would not be available to finance working capital. Moreover, leasing companies usually do not require collateral. Hence, in an environment where access to capital may be difficult owing to a lack of financial visibility and collateral, leasing may provide a useful complement or substitute to traditional bank financing.

Factoring involves the purchase (at a discount) of the accounts receivable[8] of a firm by a third party (known as a 'factor'). In the case of factoring, the underlying asset is sold to the factor, which means that in the event the borrower becomes insolvent, the underlying asset (the factored accounts receivable) is not part of the bankrupted estate. Obviously, in a factoring relationship, the credit is primarily based on the quality of the underlying accounts, not the quality of the borrower.

Financial institutions and other finance intermediaries often put considerable weight on the financial conditions and reputations of the insider-owners and also on the relationship they have with them when making any investment decision. Generally, the creditworthiness of the enterprise or the entrepreneur is easily evaluated using modern credit-coring techniques when a long credit history, pledgeable assets and personal data are available.

3. Use and structure of SME financing in Europe

A higher equity share within an SME could reduce the risk of an investment and provide a firm with wider access to external finance. According to the European Commission,[9] among the different **external financing sources,** those most frequently used are overdrafts, bank loans, leasing and factoring. Other sources include external investors and subventions. Nevertheless, the majority of European SMEs depend strongly on **bank financing** (through bank loans and overdrafts).

The **availability of equity** to SMEs varies among European countries and among the different firm sizes (Table 1). In some countries such as Germany, Italy and Austria, SMEs rely much less on their own capital, while in France, Belgium, Spain and Portugal, the share of equity in the total balance sheet ranges between 39% and 42%. These differences can be attributed to differences in taxation, financial systems and legal frameworks (including the minimum equity requirements for some companies such as start-ups). History and culture play an important role, especially in the case of family ownership and reputation in some specific activities.

[8] That is, the sale payments due from customers.

[9] European Commission (2001).

Table 1. Share of equity in the total balance sheet by enterprise size (%)

Size by turnover (millions)	Austria	Belgium	France	Germany	Italy	Portugal	Spain
Less than €7m	13	40	34	14	26	31	42
Between €7m and €40m	27	38	35	22	25	40	43
€40m and more	31	39	35	31	28	51	37
All sizes	28	39	35	30	27	42	38

Source: European Commission (2001).

In general, **overdrafts** offer short-term lending that can be used at very short notice (or without any notice period at all). Although they are more expensive than bank loans, they are often preferred by enterprises because of their higher flexibility.[10] Banks typically charge 8–20% for overdrafts when there is an explicit agreement on the threshold. This rate could jump even higher when exceeding the agreed amount.

Bank loans have longer maturity and their charges depend on the interest rates. The environment of low interest rates and inflation experienced over the past few years in the economic and monetary union (EMU) have brought down the rates for bank loans. This means that SMEs can obtain medium- and long-term bank loans at rates that vary between 5–7% (which is 3–4% above the interbank rates).[11]

In terms of banking relationships, in several member states such as Austria and Germany, enterprises have traditionally relied on a close relationship with one local bank (the Hausbank), which covers relatively small credit amounts (< €100,000) and is willing to lend even when business conditions are difficult. As shown by the ENSR survey[12] (2002) (see Table 2), 52% of the micro-enterprises rely on one bank, but one-third of the medium-sized enterprises also have a relationship with only one bank. At a country level, Denmark (with approximately 90%) and Norway (with 80%) show the highest percentages of SMEs having credit lines with only one bank. By contrast, in several southern European countries, SMEs tend to have credit lines with several banks. In Spain for example, only about one-third of the SMEs have credit lines with one bank, which is similar to Greece (37%) and Italy (38%).

[10] European Commission (2001).

[11] In May 2005 the one-year interbank rates in the euro area (the Euribor-Euro Interbank Offered Rate) were at their lowest level (almost 2%) since the beginning of the 1990s.

[12] European Commission (2003).

Table 2. Percentage of SMEs with credit lines, by number of banks and size class in the EU–19

Number of banks	< 10 employees	10–49 employees	50–249 employees
Only one bank	52	39	33
Two to three banks	38	42	31
Four or more banks	6	11	22
No answer	4	7	14
Total*	100	100	100

*The sum of each column is not always 100%, due to the rounding.
Source: ENSR Enterprise Survey (2002).

As for the amount of credit, almost 60% of the SMEs responding to this question in the ENSR survey have bank liabilities of up to €100,000, another 16% have bank liabilities between €100,000 and €500,000, about 3% have bank liabilities between €500,000 and €1 million, and only 1% have more than that. Finally, with regard to the maturity period of their loans, most of the SMEs' largest bank loans have a maturity period of over three years. As Table 3 shows, the focus on short-term financing is most pronounced in the wholesale sector, whereas loans of five years and more are frequently used in the personal services sector.

With respect to alternative financing sources to bank loans, the use of **leasing** seems to be increasing in Europe. It is most often used to acquire goods with a substantial second-hand value (such as cars, real estate, machinery, etc.). The main disadvantage of leasing is that the 'effective' interest rate is usually higher compared with bank loans. Still, leasing is an interesting source of funding especially for SMEs and enterprises that have low revenues but high growth opportunities. In the EU, leasing rose in 2001 by about 8.5% compared with 2000 – in real terms, this equates to €193 billion.[13] In many countries, leasing seems to be used particularly by fast-growing SMEs (especially those in Belgium, Finland, Ireland and Spain).

[13] See Leaseurope (2002).

Table 3. Maturity period for the largest SME bank loans and sector in the EU–19 (%)

	Manu.	Const.	Whole-sale	Retail	Trans-port & comm.	Bus. Service	Pers. Service	Total
< than 6 months	7	7	18	9	5	9	6	8
6 months–1 year	9	7	7	8	8	5	5	7
1–3 years	14	22	14	14	18	17	18	17
3–5 years	26	26	18	23	26	18	16	21
5 years or longer	21	24	22	26	29	28	43	27
No answer	24	15	21	21	14	22	22	20
Total	100	100	100	100	100	100	100	100

Source: ENSR Enterprise Survey (2002).

According to the Observatory of European SMEs (European Commission (2003)), incorporating findings from the Exco Grant & Thornton Survey of European SMEs (2001),[14] about 11% of SMEs in Europe use **factoring**, but considerable differences can still be observed across countries. Whereas it is estimated that 32% of SMEs in France use factoring, it is hardly ever used in Sweden (only 3%).[15] Factoring is considered to be more suitable for small enterprises and on average 50% of the total number of European factoring companies' clients have an annual turnover of less than €2 million, with 91% having less than €15 million.[16] Despite the fact that it has been used for nearly 40 years, the average penetration rate of factoring is relatively low (only 11%). The low penetration rate of factoring can be readily confirmed when looking at the World Bank's *World Factoring Yearbook – 2003*.[17] When measuring the relative importance of factoring to GDP, the factoring rate did not reach 5.4% in Europe[18] in 2002.

Finally, the use of **trade credit** has been growing among European SMEs (see Table 4). In a survey[19] conducted by Intrum Justitia (2005), trade credit was ranked as the primary financing source above bank and other debt financing. Indeed, for a considerable number of SMEs, trade credit is a more important source of working capital than bank loans.

[14] The survey was based on 4,400 replies from a sample of 42,400 enterprises.

[15] See the European Business Survey by Grant Thornton (2001).

[16] Greater London Enterprise Ltd., Analysis of Use of Factoring, Brussels (2003).

[17] See World Bank (2004).

[18] This includes the EU-25 plus Iceland, Norway, Russia, Switzerland and Turkey.

[19] The survey was conducted in 23 European countries in February 2005. More than 6,500 companies took part in the survey.

Table 4 Amounts owed to trade creditors due and payable within one year, 2000 (percentage of total capital)

	Manufacturing[b]		Retail trade[c]		Transportation/ Communication[d]	
Firm size	Small	Medium	Small	Medium	Small	Medium
Austria	**12.01[a]**	**8.53**	**21.17[a]**	**15.36**	**16.12[a]**	**9.49**
Belgium	**17.18**	**20.98**	**21.11**	**28.84**	**17.55**	**22.97**
France	**25.55**	**25.88**	**28.70**	**32.5**	**24.78**	**19.23**
Finland	**7.36**	**3.92**	**20.47**	**13.4**	**11.12**	**5.72**
Germany	**13.23**	**10.80**	**24.21**	**19.01**	**na**	**na**
Italy	**23.94**	**26.46**	**31.82**	**39.99**	**13.89**	**21.76**
Netherlands	**na**	**8.37**	**na**	**7.75**	**na**	**7.3**
Portugal	**16.05**	**15.56**	**27.73**	**26.78**	**10.61**	**3.5**
Spain	**21.04**	**19.33**	**27.35**	**26.33**	**11.17**	**5.24**
Sweden	**10.84**	**16.93**	**18.01**	**22.24**	**10.68**	**11.67**

[a] Data refers to 1999.
[b] Manufacturing refers to the following sectors of NACE Rev. 1: 13–22 and 24–36.
[c] Retail trade refers to the following sectors of NACE Rev. 1: 52.1–52.6 + 50.5.
[d] Transportation and communications refers to the following sectors of NACE Rev. 1: 60–64.
Notes: "Small" refers to enterprises with an annual turnover of less than €7 million; "medium" refers to enterprises with an annual turnover of between €7 million and €40 million.
Source: BACH Database, August 2003.

Trade credit is easily accessible even under conditions of slow growth or recession when banks become more reluctant to lend. The charges involved in this form of financing include the financing cost and a risk premium. Frequently, a cash discount for immediate payment is offered by the supplier, which if not used by the client constitutes an additional cost. Further, many SMEs are not able to pay their suppliers on time before they are paid by their customers owing to liquidity constraints. The same survey confirmed that a large proportion of companies are forced to pay invoices later because they are not able to generate sufficient cash-flow.

Not surprisingly, the amounts owed to trade creditors are larger in countries with longer payment periods[20] (Table 5). The effective payment periods differ by country: for example, in 2002, it took on average 87 days before payment was made in Italy (corresponding to a delay of 21 days), whereas in Sweden, firms collect their debts within an average of 34 days (corresponding to

[20] The payment period is part of the contract between the supplier and client. The difference between the contractual or target payment period and the effective period is the payment delay (late payments). In other words, suppliers offer their customers a payment delay but the latter do not always pay on time; therefore they automatically obtain extra credit.

a delay of only 8 days). This trend is confirmed by the Intrum Justitia survey (2005), which revealed that invoices in the Nordic countries are generally paid with a delay of one week with respect to the agreed terms, while in southern countries such as Italy and Spain, delays average between two and three weeks – with the notable exception of Portugal, where payments are made up to five weeks after the due date. The same survey in 2005 showed an overall increase of the average payment duration to 57.4 days in 2004 as compared with 56.2 days in 2003.

Table 5 Payment behaviour in Europe in 2001–02 (in days)

	Payment target		Payment delay		Total		
	2001	**2002**	**2001**	**2002**	**2001**	**2002**	**2004***
Italy	64	66	24	21	88	87	91.7
Belgium	41	39	20	22	61	61	58.7
France	45	46	12	10	57	56	58.7
UK	29	31	28	23	57	54	51.4
Netherlands	26	26	21	20	47	46	58.7
Germany	23	23	18	17	41	40	41.1
Austria	25	27	13	10	38	37	41.1
Switzerland	24	22	16	14	40	36	41.1
Sweden	24	26	8	8	33	34	31.8

* Data for 2004 from Intrum Justitia (2005).
Source: Creditreform (2003).

Comparing the composition of external financing resources among European countries, no single pattern emerges (Table 6). In Spain, France, Luxembourg, the Netherlands and Portugal, leasing is used more often than overdrafts, while factoring seems to be especially important in France. In other countries such as Denmark, Italy, Ireland and Sweden, enterprises have a particular preference for using overdrafts to finance their businesses.

Overall, according to the Exco, Grant & Thornton survey of SMEs (2001), 46% of European SMEs rely on bank loans, 50% use overdrafts, 39% use leasing and some 11% use factoring. Hence, the strong reliance on loan finance implies an equally strong need for collateral to secure access to loans for healthy businesses.

Table 6. SMEs' use of external financing in the EU by type (%)

	Overdrafts	Leasing	External investors	Factoring	Bank loans	Subventions
Belgium	37	25	12	4	56	14
Denmark	73	25	13	7	24	7
Germany	47	43	5	2	66	7
Greece	23	15	10	8	68	12
Spain	8	48	15	15	58	10
France	36	47	7	32	63	11
Ireland	70	48	19	14	39	10
Italy	78	41	7	17	17	10
Luxembourg	22	33	15	11	44	15
Netherlands	17	31	11	3	50	9
Austria	42	39	1	6	65	8
Portugal	16	47	7	10	48	6
Finland	46	27	15	14	64	11
Sweden	70	29	10	3	27	6
UK	59	42	11	7	34	10
Total EU-15	50	39	9	11	46	9

Source: Exco, Grant & Thornton survey of SMEs (2001).

4. The main constraints to SME financing by banks

Traditionally, SMEs seem to have suffered problems when looking for external financing. For them the cost of borrowing (interest rates and charges) is an important issue. Despite the steady decline of interest rates in the euro area during the past few years, external finance tends to be more expensive for smaller firms than for large ones, as the fixed costs of lending (administrative costs, the cost of collecting information and the risk premium) are not proportional to the size of the loan.[21]

According to the 2002 ENSR survey, 36% of the respondents were dissatisfied with their banks because they considered the interest rates to be too high, 51% of them thought that bank charges were far too high and 59% were dissatisfied with their bank's services.[22]

Some experts[23] attribute the high lending costs to a lack of competition among lenders in certain regions, which enables them to charge interest rates that are in excess of what the underlying credit risk requires. Small businesses are usually dependent on small local banks, because of their local knowledge and experience, which in turn strengthens the bank-firm relationship and contributes to reducing information asymmetry; but on the other hand, this tends to create market power, allowing a possible extraction of the surplus from SMEs.

To illustrate the financing constraints facing SMEs, the results of a survey undertaken by the European Observatory of SMEs (European Commission (2003))[24] indicate that about 30% of firms with fewer than 50 employees felt that access to finance was the major constraint to the development of their business (Figure 2).

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[21] See Wagenvoort (2003c).

[22] Efforts have been undertaken, however, by some countries such as Ireland to improve the bank-client relationship. Indeed, the enterprise support unit of the Bank of Ireland introduced a relationship-management approach to the benefit of both the bank and their clients. This approach is complemented by a range of financial and advisory services geared to the particular circumstances of start-ups and developing enterprises, and also includes 'first-step' loans, which are interest-free for a three-year period (European Commission, 2003).

[23] See Berger et al. (1998) for evidence in the US and Schure, Wagenvoort and O'Brien (2004) for evidence in Europe.

[24] The survey covered 7,600 SMEs in 19 European countries (see also European Commission, 2000 and 2002).

In terms of the business growth cycle, there are also variations among companies at different points in their development as to how much bank credit is perceived as the main obstacle to their growth (see Table 7).

The availability of bank financing is also contingent on the growth rate of bank lending in relation to the overall business cycle and also to the bank's lending approach.

Figure 2. Share of firms that consider access to finance to be the major business constraint, by size (%)

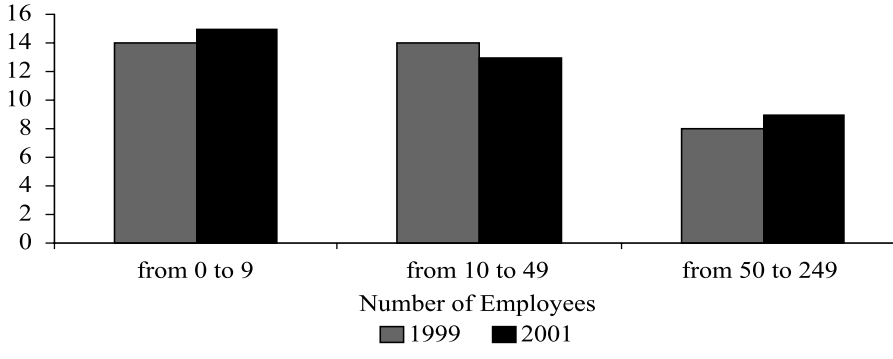


Table 7. Main financial obstacles to growth at the different development stages of companies (%)

Company obstacles	Early stage	Limited growth	Very innovative	Strong growth
Financing as the main obstacle	**22**	**8**	**16**	**19**
Bank credit	**40**	**40**	**47**	**50**
Bank guarantees	**33**	**37**	**44**	**48**
Personal guarantees	**25**	**26**	**36**	**39**
Guarantees on fixed assets	**4**	**5**	**5**	**7**

Source: European Commission (2003).

In the past few years, the growth rate of bank lending has slowed – reflecting the weak economic cycle and lower demand as well as more selective lending – to the extent that SMEs have feared a potential 'credit crunch'. This trend was not, however, indicative of banks refusing to grant credit to SMEs, but rather evidence of a more cautious lending approach as banks sought higher profitability and to meet greater risk-management requirements. On

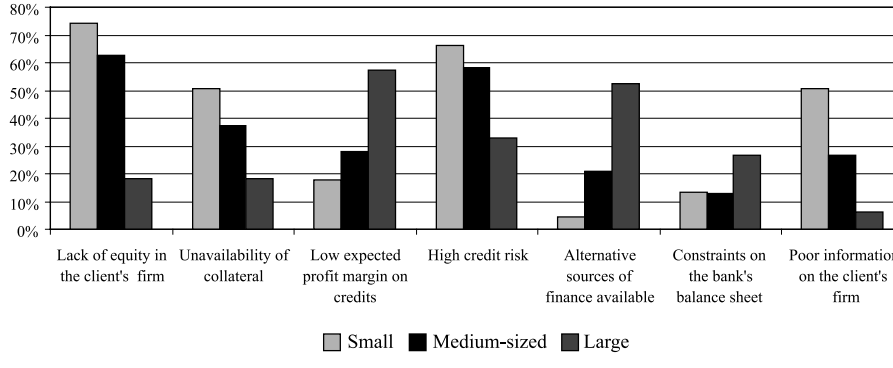
the contrary, the EIB survey (2003) of some 70 European banks showed an increase of credit volumes to consumers and businesses during the period 2000–02. Similarly, another survey conducted by McKinsey & Company for the European Commission (2005c) (hereafter referred to as 'the McKinsey & Co. survey') shows that banks view the SME credit business as a core element of their portfolio and want to increase their growth in this sector.[25]

Looking at the reasons that impede lending to small and medium-sized firms (Figure 3), those banks interviewed by the EIB survey identified four obstacles ranked by their level of relevance:

1) lack of equity in the client's firm,
2) high credit risk,
3) availability of adequate collateral and
4) poor information on the client's firm.

As shown in Figure 3, there are striking differences among the obstacles identified in relation to the development of bank lending to firms of varying sizes. For example, the lack of equity, company risk and available collateral are the main problems for SME financing, whereas low expected profitability is the main brake on financing for large firms. Each of these issues is examined below.

Figure 3. Main obstacles to the development of bank lending to firms



Lack of equity. As discussed in the previous section, the average rate of equity financing is usually low in Europe, owing to the long-anchored loan

[25] This survey was conducted with a sample of 44 large and 1,000 medium-sized European banks, in which 33 large and 71 small and medium-sized banks responded. The participating banks cover 39% of European banking assets. For more details, see European Commission (2005b).

financing tradition. The availability of equity in SMEs varies among countries and depends on the SME's size. As previously noted in Table 6, equity shares vary between 13% and 51% in Europe. In France, Belgium and Portugal, for example, equity financing is more prevalent but still it represents one-third of the total balance sheet. This variation is primarily a result of heterogeneous tax laws among the member states, which may be more favourable in some countries such as Belgium[26] and less favourable in others such as Germany.

High credit risk. When launching a new business or an innovative project, the entrepreneur is normally better informed about the project risks than those financing it. This may prevent lenders from observing the real nature of the borrower or influencing the borrower's strategic behaviour after the credit is released. As a result, the lender could voluntarily raise the risk premium on loans to properly manage its risks,[27] which translates into higher interest rates for borrowers. This situation may trigger an adverse-selection effect that encourages riskier behaviour owing to the moral hazard principle, which in turn enhances the probability of default and may encourage credit rationing. Indeed, the borrower may suffer from credit rationing as they may not be able to obtain as much credit as they want even though they are willing to pay the interest rate set by their lenders or meet extra conditions to ensure their solvability.[28]

In view of the upcoming regulatory changes for European banks (Basel II and the CRD), the proper management of credit risk will be even more important than it is today. Hence, banks will rely on more sophisticated risk-management techniques and extensive information on the borrower to derive the probabilities of default and other risk parameters.

Availability of adequate collateral. A bank is inclined to ask for collateral to reduce the loan loss in the event of default. For an SME, however, providing collateral is not always an easy task,[29] especially the type that protects the

[26] It is commonly known that tax regimes in the UK and Ireland are more favourable to the establishment of SMEs, but no data on the average rate of equity financing were available.

[27] Governments in many countries are aware of the negative effect that credit rationing has on SME growth and have undertaken initiatives to address the perceived funding gap in their national economies. These include investing in loans and equity guarantee schemes, venture capital trusts, grants, equity investments and other programmes.

[28] The theoretical literature on credit rationing as a result of asymmetric information was initiated by Stiglitz & Weiss (1981).

[29] It is necessary to define what kinds of assets are acceptable collateral from the bank's point of view. The most common form of collateral is real estate (either owned by the business or privately owned by the entrepreneur). It may also happen that SMEs assign private or personal savings books to banks as collateral. Other assets such as accounts receivable, inventories or fixed assets could serve as collateral if they fulfil specific conditions.

lender for the amount of risk taken.[30] This situation may explain why 23% (and 34%) of those SMEs employing between 0-9 employees and between 10–49 employees respectively are not able to access bank loans according to the ENSR survey (2002).

Informational opacity. Small firms are considered to be more vulnerable than larger ones as they face less rigorous reporting requirements owing to their age and their short credit history. Indeed, unlike larger firms, small firms do not enter into contracts that are publicly visible and widely reported in the press – contracts with their labour force, their suppliers and their customers are generally kept private. In addition, small businesses do not issue traded securities that are continuously priced in public markets. Nor do they have audited financial statements that can be shared with any provider of outside finance. Some family-owned businesses, for example, are very reluctant to report strategic (sometimes considered to be confidential) information such as business structure, growth opportunities, strategic orientation and even ownership structure. As a result, small firms are often unable to convey their status in a credible way, and have more difficulty building a reputation to signal their high quality as a borrower. The inherent characteristics (and weaknesses) of SMEs in terms of size and limited access to capital markets feed their informational opacity, which may prevent easy access to sources of finance and in some cases makes financial contracting problematic.

According to the Observatory of European SMEs (European Commission, 2003), the availability of information is a basic condition for granting loans to small- and medium-sized enterprises. But the evidence shows that banks only receive balance sheets and the profit and loss accounts from about two-thirds of their SME clients. More sophisticated documents such as budgets for the next few years, financial plans, cash-flow forecasts, information on inventories, unpaid invoices or qualitative information are seldom provided. Generally, the provision of all the information required is a perquisite to extend a loan or an overdraft.

Yet some improvements in the information flow have been observed in comparison with a few years ago. SMEs are becoming more proactive and they more readily deliver their financial statements and inform their banks about major developments in their businesses. Nevertheless, the information provided by SMEs is less sophisticated and less well-structured or validated as compared with the information provided by large enterprises. Small firms

[30] SMEs generally lack sufficient collateral. Yet even if collateral is available, an economic slowdown may have a negative effect on its value (European Commission, 2001).

usually have small accounting departments or none at all. The entrepreneurs themselves may lack financial administrative skills or are so involved in day-to-day business matters that the documents required by the bank are often neglected. Entrepreneurs should overcome these weaknesses before the implementation of the new CRD in Europe. Indeed, providing balance sheets and profit and loss accounts will be a standard requirement for all enterprises in Europe in order to have access to banking finance.

To explore the list of obstacles to SMEs financing, we conducted direct interviews with banking experts. According to them, the four factors mentioned above are not the only factors that impede the granting of loans. Poor business performance, a lack of entrepreneurial skills and uncertain development prospects are shown to be equally important. The first of these – poor business performance – can be indicated by a low equity ratio, insufficient cash-flow and liquidity problems. The latter two problems can be exacerbated by late payments as well as by bad credit management.

If some of these obstacles are assessed as being prevalent, many banks are not willing to provide or extend a credit line, even if the SME can offer enough collateral. For some existing clients, the reduction of current credit facilities is more likely to happen than a complete withdrawal of all facilities extended to the firm. This reduction is essentially a consequence of the bank's assessment of the risk profile of the firm. The extension of existing credit lines to SMEs might become more difficult as a result of the more stringent regulatory conditions of the new capital requirement rules.

Based on the analysis above, it can be concluded that although alternative financing sources such as leasing, factoring and trade credit exist, SMEs rely heavily on bank financing. But bank financing requires a large volume of financial and strategic information that ought to be provided by SMEs to reduce the information gap between the borrower and its lender. In the face of the new requirements of Basel II globally and the new CRD in the EU, banks will have to reconsider their traditional approaches. Further, the new rules introduce stricter requirements to counter growing concerns about risks at the European and global levels. SMEs need to understand these regulatory changes as they will have some impact on their financing conditions, not necessarily by reducing their credit facilities but by rendering the whole process more risk-sensitive and dependent on the individual quality of the borrowers.

5. What is the likely impact of the CRD on SME financing in Europe?

In Europe, the majority of SMEs rely on loan financing as previously shown; however, another option exists for a bank – which is to finance companies through equity, either directly or through venture capital. Basel II and the CRD will impact SME financing, which may at a first sight raise some questions about the overall consequences of these changes. Although the new Basel capital rules will certainly impact the credit conditions for SMEs, they may not necessarily lead to a reduction of credit supply to these entities.

In terms of the cost of credit, Basel II will directly affect three components of the cost of credit to SMEs. First, the administrative or operational cost resulting from the processes to originate and manage loan portfolios may increase owing to the use of more sophisticated risk management tools that require greater investment in infrastructure (data collection, database maintenance and adequate modelling) and human resources. Second, there is *the cost of risk* composed of the cost of capital, which is the opportunity cost resulting from the fact that banks need regulatory and risk capital to cover loan exposures, and finally *the risk premium*, which is linked to the probability of default of the borrower, the exposure at default and the loss given default. The impact of the new banking regulatory rules on these latter two costs is not straightforward since it will depend on the risk characteristics of the borrowers (see Box 2).

The more risk-sensitive pricing introduced by the new rules through the IRB approaches will entail a certain variation in capital adequacy, depending ultimately on the individual quality of the borrowers. A poor-quality borrower (rated B or CCC) will force its lender to hold more regulatory capital compared with a better-quality borrower (rated AAA or AA), but this does not ban loan financing.[31]

As shown in Figure 4, lending to small businesses under the IRB approach would reward highly rated businesses by only requiring banks to hold approximately 2% of capital charges as compared with 8% under the current Basel rules. The low-rated firms will cause their lenders to hold more than 8% of capital charges to

[31] Ayadi & Resti (2004).

Box 2. What impact does Basel II/CRD have on the cost of credit to SMEs?

The consumption of the credit institution's own resources (equity, subordinated debts and other reserves) has a direct relationship with the risk incurred by its credit and other operations. This is the essence of the risk premium, an important component of the cost of credit. Typically, the cost of credit includes:

- the refinancing cost, which is the price paid by the credit institution to its resource providers (the shareholders and other stakeholders);
- the administrative cost, which includes the cost of collecting, processing, analysing and evaluating the borrowers' information, the follow-up and the control of the different lines of credit;
- the cost of the credit institution's own resources (tier 1 and tier 2), which is the opportunity cost requested by the shareholders of the institution;
- the risk premium, which is the additional cost sought by the credit institution from each borrower to cover its expected and unexpected losses; and
- the credit institution margin, which is the profitability of the bank.

Basel II/CRD will have an effect on:

- the administrative cost, owing to the more sophisticated evaluation process of credit risk;
- the cost of the credit institution's own resources, because of its relationship to the consumption of capital, the risk of the portfolio and the higher capital requirements; and most importantly,

tax the high risk inherent in this type of business. Under the standardised approach, the risk sensitivity of the new rules is lost, which means that a bank is required to hold the 8% of capital charges irregardless of the quality of the borrower.

Figure 4a. Capital charges by portfolio and approach: Medium to large corporations

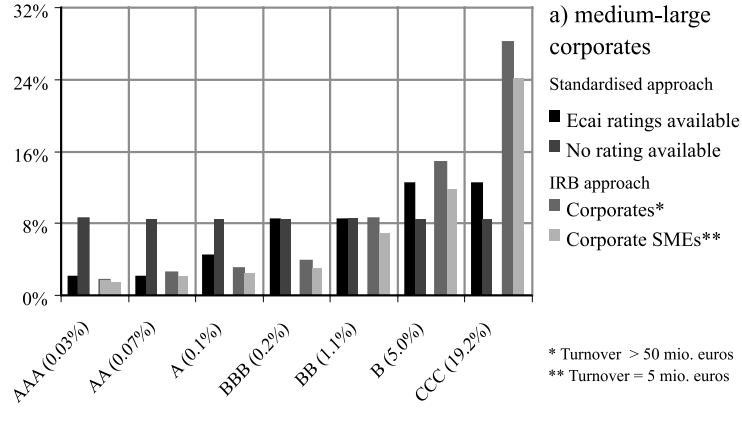
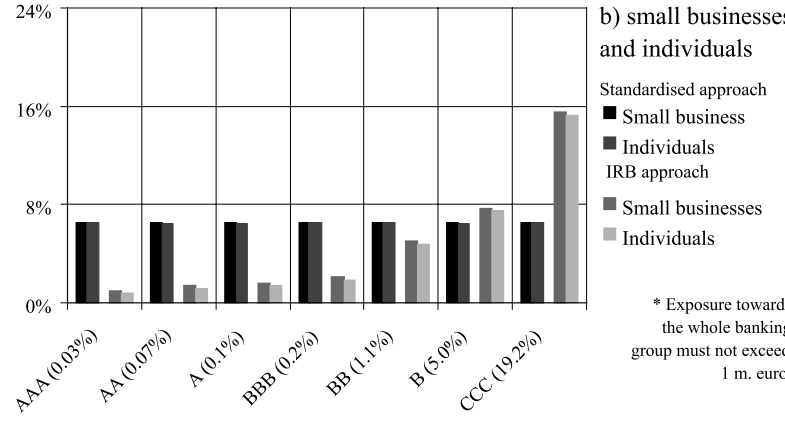


Figure 4b. Capital charges by portfolio and approach: Small businesses* and individuals



Source: Ayadi & Resti (2004).

On average, results from the third Quantitative Impact Study of European 'group 2' banks – those that are small and generally less complex and not internationally active – showed that no matter which category the SME exposure is assigned (to the corporate or the retail portfolio), the new regulatory capital rules will yield a lower SME risk weight compared with the existing framework (Table 8).

Moreover, as noted earlier, the European Commission report (2004a) on the consequences of the Basel II rules for all the sectors of the European economy with a particular focus on SMEs concludes that the new Accord should not have any negative impact on the availability and cost of finance for SMEs in most European countries. It points out that worries about an increase in the cost of finance owing to an increased use of internal ratings in lending activity are not justified. On the contrary, capital requirements relating to SME credit risks are expected to decrease, notably when using IRB approaches.

Other empirical studies[32] undertaken to assess the possible effects of Basel II implementation on SMEs in Europe generally find that the new banking rules lead to capital requirement savings linked to the SME segment when using one of the proposed approaches. When using the standardised approach, banks will enjoy more savings when SMEs are considered under the retail portfolio (the risk weight goes from 100 to 75%). When using one of the IRB approaches, banks are allowed to personalise the capital requirement

[32] See Schwaiger (2002) for the impact of Basel II on Austrian SMEs, Saurina & Trucharte (2004) for the impact on Spanish SMEs and Altman & Sabato (2005) for the impact on Italian SMEs.

calculations and build their own models to estimate PDs when using the foundation IRB approach and PDs, LGDs and other parameters when using the advanced IRB approach for each client.[33]

Table 8. Changes in the capital requirements (as compared with the present Accord) for 'group 2' banks*: Total effect and contributions of individual sub-portfolios

	Standardised (%)	Foundation IRB (%)
Sovereign	0.03	0.69
Bank	1.30	1.11
Retail (including small businesses)	–9.33	–22.46
Corporate	–0.74	–3.79
Corporate SMEs	–2.23	–4.93
Operational risk	9.41	6.36
Securitisation	0.07	–1.82
Trading portfolio	0.10	0.05
Specialised lending	–0.61	1.01
Equity	0.14	1.37
Receivables	0.00	0.00
Investments in related entities	0.64	1.12
Use of general provisions	0.00	–2.57
Total	–1.22	–23.86

*Small and generally less complex banks that are not internationally active.

Source: European Commission (2003a). Individual data were weighted based on each bank's relevance inside its national system; national data were weighted according to the amount of regulatory capital (tier 1 + tier 2 – deductions) present under the current Accord in each of the 15 EU member states.

It should be borne in mind, however, that this average reduction does not mask a strong variation among banking institutions of different sizes when adopting the standardised, foundation or advanced IRB approaches. Furthermore, different lending procedures and varying risk management expertise will lead to diverse outcomes throughout the banking industry, with better-rated banks able to manoeuvre more and lend at better rates. On the whole, it is very likely that banks opting for the more-advanced rating approaches would have a competitive advantage when lending to SMEs within the retail bracket.

Indeed, these different approaches will certainly generate differences in capital requirements for different quality SME portfolios, favouring to some extent the large internationally active banks that are more willing to adopt the

[33] See Heitfield (2004) who explains how banks should choose their own rating philosophy.

advanced IRB approach and thus benefit from a considerable capital discount on highly rated SMEs, notably those treated as retail. The high risk-sensitivity of the IRB approaches would benefit the investment grade SMEs and penalise the riskier ones (say B-rated borrowers and below). The latter will be less expensive for banks adopting the standardised approaches; the opposite is true for highly rated SMEs.

The existence and the application of sophisticated credit-risk management tools will be a key element for banks to qualify for the advanced IRB approaches and in turn to ensure better risk-management of their credit portfolios, including the exposures to SMEs.

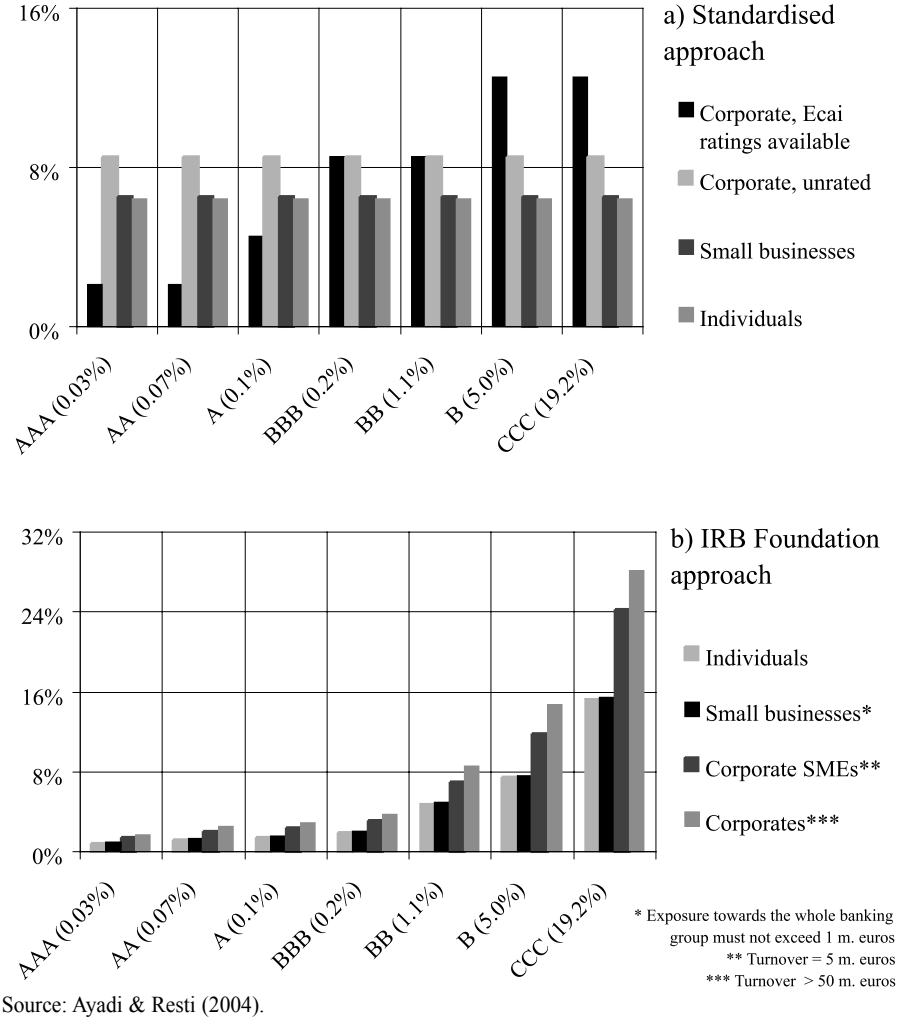
Small- or medium-sized banking institutions that have poorer internal risk-management systems and are unwilling to install more sophisticated tools will have to adopt the standardised approach, which is a fairly improved version of the current capital regulatory rules. This does not lead to capital charges for the SME portfolio that are different from the current rules (on average the 8% capital requirements are kept regardless of the rating of the borrower); but it would result in a deterioration of their asset quality since they do not have the adequate rating system to isolate and reject high-risk borrowers. The greater risk sensitivity introduced when using the foundation IRB implies low capital requirements in particular for good quality SMEs and relatively high capital requirements for poor quality ones (see Figure 5).

This is not necessarily bad news for SMEs, since a medium-to poor-quality borrower is better off asking for a loan from a bank using a standardised approach, whereas highly rated SMEs are better off asking for loans from IRB banks.

As previously explained, traditionally small and medium-sized banks are active locally and are the main supply sources of external finance to SMEs. While they have a strong long-term relationship[34] with their clients based on local knowledge and experience (which helps to reduce information asymmetries), they may profit from their local dominant position by extracting 'rents' from SMEs, a situation that leads to higher charges. In this respect, it is important to monitor and ensure that anti-competitive behaviour is kept under the competition authorities' control.

[34] See Boot (2000).

Figure 5 Capital charges by approach and portfolio type: The standardised approach vs the IRB foundation approach



Source: Ayadi & Resti (2004).

Finally, the higher risk-sensitivity introduced in the new capital adequacy regime, while drawing a more precise picture of the creditworthiness of borrowers, is likely to raise capital charges in times of economic downturn. As a result, capital requirements may become a limitation for granting loans to SMEs and others, which in turn could intensify the economic slowdown. The pro-cyclical effect of the new Accord arises from the use of risk-sensitive techniques in the internal credit-risk systems. These effects are certainly different while using the standardised or the IRB approaches.

Indeed, according to a study by the Bank of England,[35] which sought to estimate the extent to which banks would downgrade loans in a recession, ratings based on Moody's approach lead to little, if any increase of capital requirements, whereas ratings based on a Merton-type model[36] lead to an increase of 40 to 50%.[37] The strong reactivity of the more sophisticated risk-assessment models (such as Merton-type models) is mainly related to the correlation of the probabilities of default to the economic cycle. Indeed, the probabilities of default are lower when the economic conditions are favourable and higher when the economy experiences a downturn. Confirming these conclusions, Altman et al. (2002) investigated the link between probabilities of default and loss given default and the effects of procyclicality on capital requirements. They found that banks that estimate probabilities of default and loss-given default had to reduce their credit portfolios to a larger extent, compared with banks that only estimate PDs and rely on supervisory estimates of LGDs. This finding provides clear evidence that the procyclicality of the Accord is more prominent when using the advanced IRB approach.

When the economy is in a downturn, the high risk-sensitivity of Basel II may indirectly exacerbate the deterioration of SME financial conditions since banks are more likely to cut credit because of the overall deterioration of the asset quality. At the same time, the payment behaviour of companies is very likely to deteriorate, which typically undermines SMEs' commercial transactions. This would create cash imbalances due to late payments, casting additional doubt on SMEs' creditworthiness and as a consequence would curb lending even more. Reduced lending would have a direct negative effect on growth, suggesting that some corrective measures should be put in place to avoid exacerbating the cycle.

Against this background, when asking bankers whether the new Basel Accord would make lending to SMEs less attractive in comparison with large companies, a survey by the European Investment Bank (Wagenvoort, 2003c) showed that roughly one out of four bankers still finds it difficult to assess the possible impact of Basel II on SME lending (see Figure 6).

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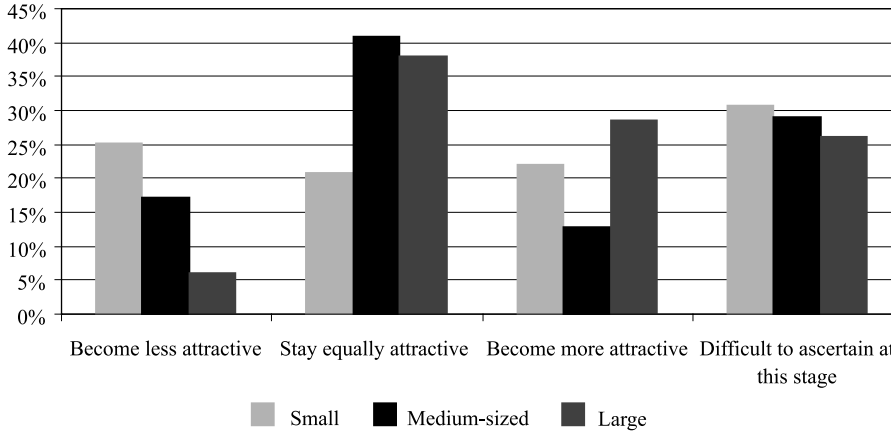
[35] See Catarineu-Rabell et al. (2003).

[36] A Merton model or structural credit risk model was first proposed by Black and Scholes' and developed by Robert Merton in 1973 in his seminal paper on option pricing, as well as in a more detailed paper in 1974. Merton had in fact anticipated the model earlier in 1970. This fact, along with his active support of the work of Black and Scholes, is why the model is often referred to by his name.

[37] Similar results were found in Kashyap and Stein (2003); see also Jordan et al. (2003).

Figure 6. The likely impact of Basel II on firm lending



Source: Wagenvoort (2003c).

Around 40% of the bankers are of the opinion that lending to medium and large firms will remain equally attractive as under current banking regulation. With respect to small firms, only 20% of the respondents think that Basel II will be neutral for small-firm lending. Among those who expect Basel II to have an impact on loans to small firms, about half think that Basel II will stimulate lending while the other half anticipates a negative impact. In other words, it is expected that there will be banks reducing small-firm lending, but this reduction is likely to be offset by other banks that increase it. Recently, the McKinsey & Co. survey confirmed that an overwhelming majority of banks view the SME credit business as a core element of their portfolio and showed their interest in increasing it.

In terms of the practical implications for SME lending, the new IRB approaches to managing credit risk imply an increase of work to maintain updated and completed databases and to review the ratings and the factors involved in the modelling process more often. Indeed, there is a strong expectation that IRB banks will require their clients (notably SMEs under corporate and retail portfolios) to provide more, better structured, focused and timely data (financial statements, business plans, etc.) to complete their systems and to allow them to produce a precise and adequate ratings closely aligned to their risk profile over time. Covenants will become standard features of loan contracts (in particular ratings, leverage and liquidity) especially for long-term credit and the trend to collateralised lending as a means to mitigate credit risk will continue. The most tangible changes are the use of a more sophisticated statistical design to derive the ratings and the way this information is interpreted when using the

most sophisticated statistical techniques to convert quantitative and qualitative data into ratings and probabilities of default, which will enhance the ability to identify potential future defaults. These changes will entail a much tighter and more systematic monitoring of creditworthiness of the borrower and credit risk overall. Yearly rating will be a common standard for banks to help identify problem loans. The monitoring process will be based on the data submitted yearly by the clients, and any delay in submission will serve as a warning signal and most likely lead to a downgrading. These conclusions were confirmed by the majority of banks in the McKinsey & Co. survey (European Commission, 2005b).

On the one hand, Basel II is a revolution in terms of improving risk management through the introduction of more risk-sensitive and more sophisticated tools borrowed from modern finance theories. But on the other hand, it may create a higher burden for some small enterprises (notably the potentially low-rated SMEs), which would need to provide well-structured and timely financial statements, to keep their bank accounts in a straight line with their agreements, to communicate any change (in the personnel and capital employed in the firm and arrange the successor matters), to provide adequate guarantees and collateral and to manage their credit function very carefully. These enterprises could still overcome the burden by internally managing their own risk: first, by investing in the accounting/financial function and ensuring they submit accurate and timely information about their financial situation to their banks; second, by implementing a viable credit management method that could be complemented by credit insurance to monitor their clients' payment behaviour and therefore to avoid bad payment habits or coverage in the event of insolvencies. This would in turn lead to a more stable cash flow and hence may improve the enterprise's creditworthiness.

Banks also have the alternative to finance SMEs in the first stages of their growth cycle through equity either directly or by investing in private equity or venture capital. Under the Basel I Accord, equity positions are risk-weighted at 100%, which does not correctly reflect their underlying risk profile. The risk weights assigned to these types of exposures, which are considered to be high-risk categories, are noticeably higher under the new Basel rules. The European Commission's CRD proposal has introduced lower-risk weights to such exposures, as compared with the original text of Basel II, but these are still considered to be higher than the current rules.

The new treatment may limit the attractiveness of this type of financing. The higher charges imposed on direct-equity financing and bank investments in

private equity and venture capital business in Europe will inhibit banking institutions from investing in such businesses, as they are becoming very costly.[38]

Some SMEs, in particular those developing new technologies ('high-tech' SMEs) and relying to a certain extent on private equity and venture capital financing, will be somewhat affected by this treatment.[39] Indeed, developing new technologies is considered to be a risky business in addition to the uncertainty of expected returns, where the problem of information asymmetry is prominent.

6. Measures to improve SME financing under the new rating culture

Banks have been and will continue to be the most important source of financing for SMEs in Europe. Today, banks are facing a drastic change in the manner they usually conceive their business. Indeed, recent developments such as emerging risk-management techniques, financial innovation and other drivers linked to the high expectations of shareholders and regulators have brought new challenges for banks. Hence, they need to run their business with the most accurate tools not only to meet expectations but also to position themselves against fierce competition. In practice, banks must manage the risks to which they are exposed very carefully, with a specific focus on credit risk stemming from counterparties of varying risk quality. The SME sector is clearly one in which banks are looking to expand – first because SMEs have a high potential for innovation and flexibility and second because they foster growth. In parallel, the European Commission is committed to creating the best possible environment for SMEs to grow and to contribute to the realisation of the EU's Lisbon Agenda of March 2000.

[38] The role of banks in developing the European private equity and venture capital market is essential as banks contribute 25% of all capital committed (EVCA, 2004).

[39] According to a survey of European venture capital conducted by Bottazzi et al. (2004), almost 1,300 European firms were financed by European venture capitalists. These firms mainly belong to the high-technology industry.

The new requirements introduced by Basel II in parallel with the CRD mirror the trend in the financial industry towards more scientific risk-measurement and management. Since managing risks is the core of business of financial institutions, they ought to do it in the best possible way. Hence, the new regulation creates higher incentives for banks to assess the risk inherent in each individual exposure: riskier lending will be more expensive while safer lending will be less costly. In other words, for the banks that choose the IRB methods, there will be no room for cross-subsidisation. For these types of banks, credit decisions will be based on the individual risk quality of each borrower and his or her capacity to repay debt over time.

For SMEs, this will mean that their rating and probability of default are the determinant components for credit decisions (acceptance, rejection and conditions). They are also going to have a wider range of choices in terms of price and credit conditions. Since SMEs will not necessarily be aware of these changes, it is important that banks inform them. SMEs will also need to expend greater efforts and cooperate in a constructive way.

At the same time, the public sector should take action in terms of improving the general framework conditions of finance. Together with the markets, the public sector should act as a catalyst to encourage development.

The role of banks

As previously shown, gaps in information between borrowers and lenders are among the root causes of financing constraints for SMEs. The establishment of a long-term relationship based on increased transparency is key to reducing these information asymmetries.[40] The new banking regulations also cite increased transparency as a precondition for an effective cooperation between lenders and SMEs.

Banks should not hesitate to play their role by informing their customers about the changes and showing them how ratings impact their credit terms. Communication should not be limited to the reasons for not granting bank loans or withdrawing existing credit lines – it should be built upon mutual trust between banks and SMEs. Indeed, since ratings and associated probabilities of default are becoming the main factor for deciding whether or not a bank assigns or extends a line of credit, SMEs will need to be informed.

[40] See Boot (2000).

Therefore, bank procedures – including individual ratings, risk assessment and the factors leading to downgrading – will *need to be more transparent* to SMEs. In our interviews conducted with banks (for the purpose of this work), they were asked about their plans to disclose the rating process and individual ratings to their clients. Only a minority intend to disclose the individual ratings voluntarily. The majority plan to inform customers about the main drivers of the rating decision to enable them to address the necessary levers leading to an improved rating and to mitigate credit risk.[41] Obviously, a variety of views emanated from these interviews.

Against these different views, it is advisable to define minimum criteria on the level of the transparency required, which is not prejudicial to banks in terms of cost increases or competitiveness. Disclosing and explaining the overall detailed ratings process to potential clients could overburden a bank as it implies mobilising extra human resources. If the potential client becomes a loyal customer, the additional costs incurred by the bank may be passed on as service costs to the customer. If the potential client is no longer interested or is shopping around to obtain the best ratings, then these costs will be a complete loss. Building on this point, it is crucial to define the right amount of disclosure that is both acceptable by banks and helpful to SMEs.

To explore this recommendation, our survey asked banks how they perceive an explicit regulation of ratings disclosure to loan applicants. The striking majority of respondents were not in favour of such a move since they think this would entail an extra regulatory burden.[42] In this respect, they consider that a non-legislative code of conduct between banks and SMEs should suffice to establish a framework that sets out principles on the disclosure of ratings and rating processes for banking and SME associations.

We strongly believe that a better disclosure of rating processes by banks will improve the new rating culture and also the SME–bank relationship in the rating process. It is therefore important to adequately define the principles that are the minimum requirements for governing this relationship. For example, before the rating process, banks need to inform SMEs about:

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[41] These conclusions were confirmed by the McKinsey & Co. survey (see European Commission 2005b).

[42] The adopted CRD stipulates that "banks are called upon to disclose their ratings decisions in writing and comprehensibly to SMEs and other corporate applicants for loans. Should a voluntarily undertaking by the sector in this regard prove inadequate, **national legislative measures** shall be adopted. The administrative costs for the banks have to be at an appropriate rate to the size of the loan" (emphasis added).

1) the data needed to determine the rating;
2) the factors affecting the credit decision (collateral, external ratings, etc.);
3) the principles of the rating system that will be applied (i.e. those covering the retail versus corporate categories); and
4) possible ways to improve the rating (better credit management, further guarantees, a more defined business plan, etc.).

After the rating process, banks need to communicate and explain the credit decision (acceptance, rejection or likely change of loan conditions) in a clear, comprehensible written manner. When updating the ratings (generally on an annual basis), banks need to inform their clients well in advance to provide the necessary inputs and again provide a written, comprehensible explanation of the changes.

The role of SMEs

Adopting one of the IRB approaches under the new banking regulation means that banks have to rely extensively on quantitative and qualitative information provided by SMEs. This information is essential for running the internal rating system properly. Companies that are well managed, adequately leveraged (equity ratio) and that provide timely, relevant and precise information will be in a position to obtain a better rating and consequently better credit conditions. Hence, it is crucial that companies understand and accommodate the new capital requirements in order to provide the most relevant data needed by lenders to rate their risk exposures. Below are the practical actions that SMEs must take to improve their ratings.[43]

General steps

1) Study and understand the bank requirements for granting a loan. Financial advice could be seen as an additional solution to make sure all the elements are taken into consideration.

2) Deliver clear, complete and timely financial and performance data needed by lenders to assign yearly ratings for granting a new loan or extending an existing line of credit with better conditions. Indeed, delayed submission of financial and performance data is seen to be a warning signal in many banks' internal rating systems. It usually leads to a downgrading and therefore price increases in new loan offers or the refusal of new loans.

[43] For more details, see the European Commission's (2005c) practical guide to loan financing for SMEs.

Practical actions

3) Improve the factors that are considered to be important in the rating process, specifically:

- Make sure that cash-flow stabilisation and generation receive priority among these efforts, since it is often the key tangible signal with which SMEs can negotiate their creditworthiness. This could be done by increasing and diversifying the sources of revenues (products and services), the customer and supplier's base and distribution channels, and implementing viable internal or external credit-management procedures to monitor clients' payment behaviour (receivables) and therefore avoid bad payment habits. Late payment habits from clients should be limited since the late or irregular cashing-in of revenues could easily drag down the rating and, by limiting the perceived debt capacity of the firm, may adversely affect company growth. In addition to legislative efforts to combat such malpractices (e.g. the EU's late payment directive), many companies could directly take action by (for example) using credit insurance policies to prevent and minimise late payments and defaults. Credit insurance could offer a complete risk-management tool that helps management to put in place the necessary procedures to continuously monitor the creditworthiness of clients and reduce the risk of delays and defaults.

- Increase the equity base by preferring retained earnings over distributed profits.

- Improve the accounting, controlling and management methods within the company where these need attention. Entrepreneurs should not only give more importance to the accounting and financial functions within the company but also move towards more active balance-sheet (or asset liability) management in terms of reducing the mismatch between long-term commitment versus cash. SMEs should also consider how they manage their liabilities as a means to increase competitiveness. In this respect, innovation could serve them very well – as it has served banks – to reduce the overall amount of risk through the active management of liabilities.

- Consolidate the business development strategy, encourage strategic thinking among managers in terms of the business prospects, undertake market/sector/activity analyses and improve external communications with stakeholders.

- Renew the attention given to some aspects of the business that may have been neglected, such as keeping bank accounts in line with agreements, communicating any changes in the personnel or capital employed in the firm, and determining successor arrangements for key staff.

- Put in place recovery procedures in the event of crisis scenarios such as the loss of a key person in the company, the revaluation of a national currency for companies that heavily rely on exports, etc.

4) Ensure that adequate guarantees and collateral are provided. Collateral and guarantees help to obtain better loan conditions. As previously noted, the loan pricing policy is mainly influenced by rating, term structure (maturity) and collateral. SMEs need to be able to provide adequate collateral. The list of credit-risk mitigation techniques in Basel II and the CRD is extensive, but these ultimately depend on the expected recovery rate (which is a related variable of the LGD). For example, the expected recovery rate of cash is almost 100%, while the expected recovery rate for receivables is between 60 and 95%. It is advisable for SMEs to look at other types of collateral such as credit insurance, which again could offer an indemnification for accounts receivable to increase their value when recovery is required in the case of default. Credit insurance could also serve as a protection for SMEs in countries with high political risks.

Other specific actions

5) Work more proactively to increase equity finance. Many SMEs need stronger balance sheets. Venture capital, equity finance and business angels are more readily accessible to SMEs that can show high growth potential.

6) Consider different financing sources. Although it is true that the main financing products are provided by banks, it is important for SMEs to be able to compare different financing sources to judge which is more appropriate to the risk level of the company according to its growth cycle. Leasing, factoring and other sources could offer a good response to SMEs willing to investigate other financing means, particularly for those that have more difficulties providing well-structured financial and performance data – the basic prerequisites to accessing finance through banks.

The role of public policy

Improving access to finance is an important aspect of fostering entrepreneurship and growth in Europe. Many actions have been already been taken at the European and national levels to improve access to finance. The purpose of this section is not to enumerate these actions but to suggest some improvements to enhance the environment for SME financing in the post-Basel II/CRD era.

1) There is room for continued improvement in the relationship between banks and SMEs in the new rating culture. Thus it is important to establish a non-legislative framework (code of conduct) that sets out the principles for defining minimum criteria for ratings disclosure.

2) Access to equity finance could also be improved. As equity finance is included in the high-risk category under Basel II and the CRD, banks are likely to withdraw from these investments owing to the high risk weights assigned to them. At the same time, many SMEs need stronger balance sheets that can be translated into a higher equity ratio. Hence, at the regional, national and European levels, it is important to focus on developing European venture capital markets and their liquidity, and to promote the possibilities provided by business angels and their networks.

3) Since a stronger equity base is a reflection of higher creditworthiness, it is important to recognise that retained earnings are the best form of financing growth and investment. National governments should review whether their tax laws obstruct firm growth by taxing retained earnings more than distributed profits.

4) Legislative efforts to combat late payment habits need to continue and be reinforced to ensure better stabilisation of cash flows, which are a prerequisite for better ratings.

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5. RISK CLASSIFICATION OF SME LOANS – IMPACT ANALYSIS FOR THE USE OF DIFFERENT RATING MODELS BY BANKS[1]

by Beat Bernet[2] and Simone Westerfeld[2]

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Abstract

Rating models used by banks to evaluate the creditworthiness of SME clients still differ substantially with regard to the underlying rating philosophy, system architecture and calibration. Looking at bank ratings from an SME perspective as a current or potential future borrower, the question arises as to whether the different designs of bank internal rating models lead to different rating results and subsequently to different credit conditions. This problem is the basis of the research question at the heart of this article. In our empirical study, we rate a representative sample of Swiss SME clients by different rating models. We first test whether different rating models belonging to different types of modeling architectures lead to different risk classifications (rating results), even though identical input data is used. This first hypothesis can be supported based

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on our empirical findings and may implicate the risk of rating model arbitrage against banks. The second hypothesis tested is based on empirical findings from other studies, analyzing whether the inclusion of qualitative information leads to significantly higher rating marks compared to ratings solely based on quantitative information. Our findings do not support the second assumption.

1. Introduction

A bank's decision to grant a loan and the according credit conditions (risk-adjusted prices, volume, tenor, collateral) to an SME are of significant importance for single debtors and also for the economy as a whole. The efficiency and quality of the credit rating and selection process at banks influence both the credit supply of the economy and long-term provisioning rates, thereby affecting the profitability of banks and the stability of the entire financial system.

With the implementation of the New Capital Accord in 2007, the discussion of bank internal rating models has increased both in academia and practice. The BIS paper specifies conceptual requirements for internal rating systems that need to be matched, so that an internal rating system can be accepted by supervisors (Basle Committee (2006)). However, there is a substantial degree of freedom left within these guidelines. Consequently, rating models used by banks still differ substantially with regard to the underlying rating philosophy, system architecture and calibration.

Looking at bank ratings from an SME perspective as a current or potential future borrower, the question arises as to whether the different designs of bank internal rating models lead to different rating results and therefore to different credit conditions, even though input data remains unchanged. Besides the impact for SMEs, "flawed" rating decisions might also lead to the mispricing of SME loans, which could result in adverse selection effects and a loss of market share for the respective banks.

The rating model's design is determined by the underlying rating philosophy. The rating philosophy itself is again determined by the purpose of the rating, the rating object and time dimensions. In the context of SME loans, the purpose

of the rating for the individual loan exposure is usually the determination of probabilities of default (PD). PDs can be used as a tool to control the risk exposure in a SME portfolio and as a basis for economic applications such as pricing and economic capital attribution (Nakamura/Roszbach (2005)). Usually, companies are defined as rating objects, i.e. a counterparty rating is applied (in contrast to transaction ratings). With regard to the time dimension, banks differentiate between "through-the-cycle" ratings and "point-in-time" ratings, whereas empirical studies show that the latter is more important in banking practice (Amato/Furfine (2004)). The analyses presented in this article therefore focus on "point-in-time" counterparty rating models for SMEs, which attribute a certain PD to a borrower.

Following the definition in the Basle paper, a **rating system** covers all methods, processes, controls, data and IT systems that are necessary to calibrate rating models and derive PD estimates (Basle Committee (2006)). In this article, we use the term **rating model** as being a part of the overall rating system. A rating model is used to perform risk classifications in terms of ratings. The **architecture** of a rating model describes the elements of the model and their relationships with each other.

Typically, a PD is attributed to a specific rating class. Therefore, a rating describes the ex-ante quantification of the risk, that the rating object does not perform with regard to predefined credit events, typically paying back the liabilities within a certain time frame. In practice, the attributed PDs are often used as a basis for loan decisions and the application of risk premiums and credit limits.

The article is organized as follows: Based on a literature overview, we develop two hypotheses as a framework for our empirical analysis. This is followed by the empirical analysis in section 3, where we rate a credit portfolio of 435 counterparties using three different real rating models with different architectures. We test these two hypotheses with regard to the impact of different rating model architectures on risk classification and discuss the results in section 4. In the two concluding sections, we interpret the results and develop a conclusion and potential impacts.

2. Contribution to literature

Even though external rating models of the dominant rating agencies have been analyzed in various articles dealing with different research questions (Cantor/Packer (1997), Poon (2003), Löffler (2004)), there are only limited empirical studies dealing with the impact of internal rating models on the ex-ante risk classification of loans.

In the literature, typically three types of rating models are differentiated between based on the respective information processing design (not on the underlying data). In qualitative models, experts perform rather subjective classifications within predefined categories, whereas the underlying data can be both quantitative and qualitative. Quantitative models are based on standardized and objective mathematical and statistical procedures. Models using qualitative and quantitative procedures simultaneously or iteratively are called hybrids. However, only the type of information processing – not the underlying data – determines the type of the rating model (Füser (2001); Oelerich (2004); Eigermann (2002)).

Internationally, the architecture of rating models seems to follow shared principles, even though a standard is missing. In a detailed discussion paper of the "Models Task Force" of the Basle Committee, an empirical analysis and classification of internal rating models of banks was performed (Basle Committee (2000a) and (2000b)). The analysis concludes there is no common standard for design and application of internal rating models yet. However, there are several common factors to be seen, among which are the choice of the risk indicators, the prioritization of counterparty rating before transaction rating and specific aspects of structures of rating processes.

Krahnen/Weber (2001) developed thirteen principles, which can be interpreted as quality standards for the development of internal rating models in banks. Among these are general requirements like adequate comprehensiveness and completeness as well as adequate complexity. Others requirements are model-specific e.g. detailed specification of credit events, monotonicity in the relation between ratings and PDs and the necessity of adequate granularity of the rating classes to avoid adverse selection. Similar arguments can be found in the consultative paper of the Basle Committee, which defines requirements for a rating model to be certified by the national supervisory committees (Basle Committee (2006)).

Papers by Treacy/Carey (2000) and English/Nelson (1998) describe and analyze internal rating models of large US banks. Treacy/Carey not only prove the different architecture of bank internal rating systems, they also indicate various problems that could occur from inconsistent system architectures with regard to rating. Similar studies were done for Swedish Banks and presented by Jacobson/Linde/Roszbach (2003) and Nakamura/Roszbach (2005).

An empirical study by Brunner/Krahnen/Weber (2000) deals with bank internal ratings in Germany. It focuses on the question of whether banks can use the information advantage obtained by the rating process in competitive lending markets. To do so, the impact of non-public information (qualitative factors) on the overall rating result was analyzed. The paper concludes that qualitative information tends to improve companies' overall corporate rating. This analysis is different to our approach, as data was taken from 3 different German banks which were asked to select a random sample of 200 clients from their respective portfolio and rate those clients with their own rating systems. Therefore, the samples used were independent as the borrowers were different in any case.

Other empirical studies by Hornik et al. (2005) were based on a data sample coming from the Austrian National Bank with partially overlapping client samples from 27 Austrian banks. The authors develop an approach to use multi-rater information to validate rating models for specific situations, where no historical loss data is available. Again, this study differs from our analysis, as only partially overlapping and not totally consistent input data was used.

3. Impact of different rating architectures

In balance sheet oriented banking systems (e.g. Switzerland), banks are the most important source of capital for SMEs. Banks' credit processes differ substantially with regard to their selection criteria and the according risk-adjusted assessments. Looking at this practice reveals that SMEs with more than one banking relationship receive different loan conditions from the different banks, even though the input parameters are the same. Therefore, different ratings as a result of different models have an impact on pricing, as well as on the competitive advantage of the bank due to e.g. adverse selection effects and margin erosion.

If different architectures of SME rating models can lead to different risk classifications, it is important to know exactly how the rating is influenced by the model architecture particularly as the rating architecture itself often remains a black box to the borrower. Therefore, the aim of the empirical study is to rate a representative sample of Swiss SMEs by using different rating models and test whether different rating models belonging to alternate types of model architectures lead to varied risk classification (rating results) even though identical input data is used. We test this Hypothesis H_1 in section 4.1.

Impact of qualitative and quantitative criteria

As discussed, rating models can be based on quantitative or qualitative criteria or on a combination of both. Based on Hypothesis H_1, it is important to analyze the impact of the application of qualitative or quantitative criteria and to observe how this influences the risk classification, even though identical input data is used.

Empirical studies suggest that rating models with higher measurements/ weighting of qualitative criteria lead to better rating classification in terms of lower risk. In their comparative study of the rating models of three German banks, Brunner/Krahnen/Weber show that qualitative criteria are rated significantly higher than quantitative criteria and that they show less variance across risk classes (Brunner/Krahnen/Weber (2000)). The analysis is different from ours as data from the three banks' own portfolios was used as input for the respective rating model (randomly chosen). The analysis was based on a rating scale with four classes only, so it cannot be adequately concluded whether the application of scales with finer granularity (as is common

practice now and also a Basle II requirement) would lead to comparable results. Another study by Weber/Krahnen/Vossmann showed that not only are qualitative ratings systematically higher than quantitative ratings for the same borrower, but also that over time, qualitative ratings fluctuate less than quantitative ones. (Weber, Krahnen, Vossmann (1999)).

In Section 3.2., we test the Hypothesis H_2 that risk classification by using qualitative criteria leads to significantly higher classifications compared to analysis based on quantitative criteria only.

Empirical Analysis

Based on the discussion in the above sections, the following hypotheses are tested:

- H_1: Different rating architectures lead to significantly different rating results for an identical borrower.
- H_2: The inclusion of qualitative information leads to significantly better ratings compared to ratings solely based on quantitative information.

Characteristics of rating models used

When analyzing Swiss banking practice it becomes obvious that mainly quantitative or statistical models are used, which are based both on qualitative and quantitative data (hybrid). Accordingly, we used three real statistical rating models in our analyses, which are representative for the types of models used in banking practice. The first model used is solely based on quantitative data from public information such as balance sheets and earnings statements of the companies. This model is an extreme version of statistical models used, as it does not include qualitative data at all. The other two models can be differentiated with reference to their usage of quantitative and qualitative data.

The models used are point-in-time ratings with a time horizon of 1 year (for details see e.g. Rösch (2005)). All models are based on a scoring process: a criterion is given a score by means of a determined transformation function $\{v_i\}$. Consequently, based on an aggregation rule, the individual criterion is weighted by a factor k_i. Finally, the results are aggregated following an algebraic rule. The final score determines the application of a rating class (Brunner/Krahnen/Weber (2000); Altman (2000); Hastie/Tibshirani (1990)):

$$v(a)=\Sigma_i k_i v_i(a_i) \quad (1)$$

Even though the elements of the architecture in these three models are comparable, they are different with regard to the selection criteria used, the transformation to scores and the weights applied. All three models are used in banking practice.

- **Model 1** constitutes a typical rating model of a bank and is used for risk assessments of non-listed SMEs. It is based on seven financial ratios (quantitative factors covering e.g. liquidity, leverage, profitability, revenue) and eleven qualitative criteria. The application of weights for the criteria is performed by a statistical approach: First a selection of criteria is performed separately for qualitative and quantitative criteria based on an univariate analysis and results of Receiver Operating Characteristic (ROC) – a measure for the discriminatory power of a criterion (Stein (2005); Blochwitz et al. (2004)). Finally, an iterative multivariate analysis is used (logit model) to find the best combination of the pre-selected criteria. Both ratings (qualitative and quantitative) deliver a score, which is now weighted by an additional logit model, whereas qualitative criteria are given a weight of approximately 30%. PDs are estimated and attributed to rating classes based on the historical data of the bank. The rating scale consists of ten classes for performing assets.

- **Model 2** is also a hybrid model. It is, however, different to model 1 with regard to model development, criteria used, architecture and calibration. The criteria were chosen because of their discriminatory power and ability to be communicated to users. The model consists of one part that is based on quantitative criteria and another one that rather constitutes an expert system. The latter allows the differentiation between borrowers in the higher classes of the rating system based on qualitative criteria. The transformation of the seven quantitative criteria into a score is based on logistic transformation functions. Together with two additional quantifiable criteria, the transformed requirements are combined based on multivariate optimization. The expert system covers seven qualitative factors, combining them to an expert score. The combination of qualitative and quantitative results works as follows: First a base rating is determined, based on quantitative criterion. This base rating determines the impact of the expert score. At the lower range of the rating scale, qualitative factors do not have an impact on the final rating (weight = 0%). The higher the base rating, the larger the influence of the expert system, whereas the maximum weight of the latter is 30%. The model uses ten rating classes for performing assets.

However, the best two cannot be reached by an SME. If the base rating is in class 8 to 10, no correction by the expert model applies. The best base classification is rating class 5 and the then applied expert rating can adjust the final rating to range between rating class 7 and 3.

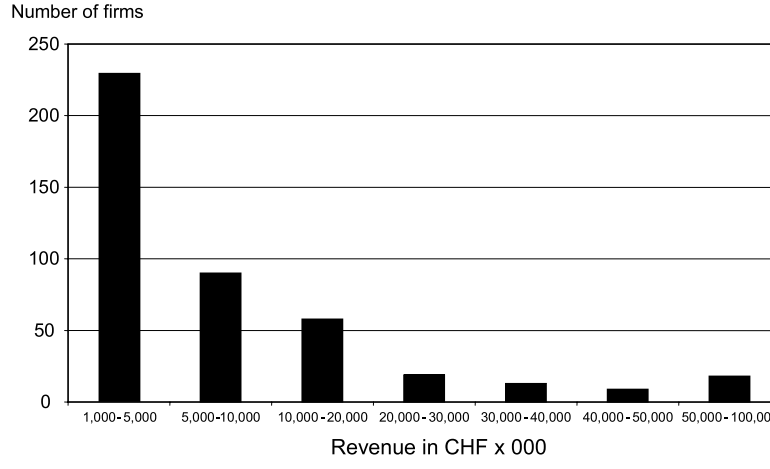
- **Model 3** is based on quantitative criteria only and qualitative criteria are not used. However, industry information is used for the application of default expectations per industry. The quantitative ratios cover profitability, leverage, debt coverage, growth, liquidity, activity ratios and size of the company. The model design reflects the fact that the relationship between a financial ratio and the PD is usually non-linear and not always monotone. At the same time, user transparency was considered when selecting the respective ratios. The model is based on a two-step function with non-parametric transformation and belongs to the class of Generalized Additive Models (see also Hastie/Tibshirani (1990)).

Data

We use the three rating models to rate a real credit portfolio from a commercial bank in Switzerland consisting of 435 representative Swiss SMEs from one region, well diversified across industries, age of the company and size (revenues between CHF 1.5m and CHF 100m). For each counterparty a real-life dataset of quantitative (as taken from balance sheet and income statements) and qualitative (non-public information as gathered by the respective credit officer) data from several consecutive years was available. Therefore, all counterparties could be rated with all three rating systems at a certain point in time between May 2005 and June 2006.

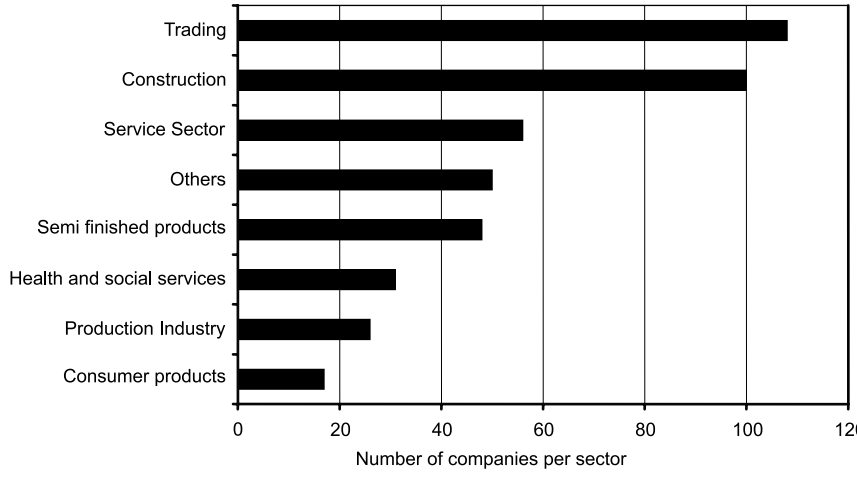
Figure 1 shows the exposure distribution in the credit portfolio in terms of revenue. The distribution can be considered as representative for a Swiss SME portfolio.

Figure 1: Exposure Distribution



The companies in the portfolio are well diversified in terms of age of the company, as there are start-ups with age <1 year at the one end and companies operating for 136 years at the other end of the scale (average of 22.52 years). Figure 2 shows the industry distribution (real estate not considered):

Figure 2: Industry Distribution



The focus on one region does not have an impact on industry distribution or risk classification.

Methodological approach

For all companies in the dataset, risk classifications are generated by using all three models at identical rating dates. First, all classifications are done using model 1 and classifications noted as 'impaired' are removed from the dataset, due to different default definitions. Quantitative data was adjusted so that it matches the respective data requirements of the rating tool to calculate the required ratios. Qualitative data was sufficient for the valuation with model 1 and 2; only a mapping of the respective scales was necessary. Model 3 does not require qualitative data, but uses balance sheet information from previous years.

The various rating models result in 1-year PDs calibrated for the respective rating classes. We mapped the original PDs on the official Moody's rating scale, so that rating results of different models could be compared. If a PD falls on a boundary of the Moody's PD bands, the lower rating class was mapped.

4. Empirical Results

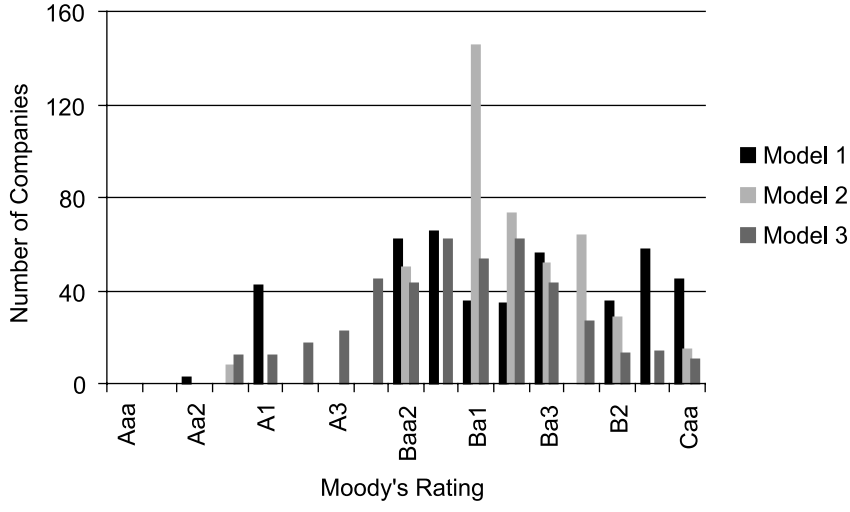
4.1. H_1: Different rating architectures lead to significantly different rating results for an identical borrower.

In order to test Hypothesis H_1 we compare the rating results of the three different models. By doing so, we use the corresponding ordinal classifications of Moody's rating scale and map the original PDs on this scale. Since our analysis shows additional insight gained by using the original PDs is marginal and presentability of the results becomes far more complex, we do not use the original PDs. The loss of information experienced through the mapping on a joint scale is small and therefore does not influence the interpretation of the empirical analysis.

We begin our tests on the basis of descriptive statistics. This test section is followed by formal robustness checks (correlation / similarity test by Bravais-Pearson/Spearman, identical distribution test based on

Wilcoxon's rank-sum test). Figure 3 shows the rating distribution of the three models for our sample of 435 corporates.

Figure 3: Histogram Rating Distribution



A comparison of the distributions of the rating scales shows a substantially different result for the three models. Models 1 and 3 incorporate an equally-weighted distribution of the ratings over the different rating classes. By contrast, Model 2 contains a strong concentration in the rating classes of Ba1 or lower.

Figure 4: Cumulative Frequency Distribution

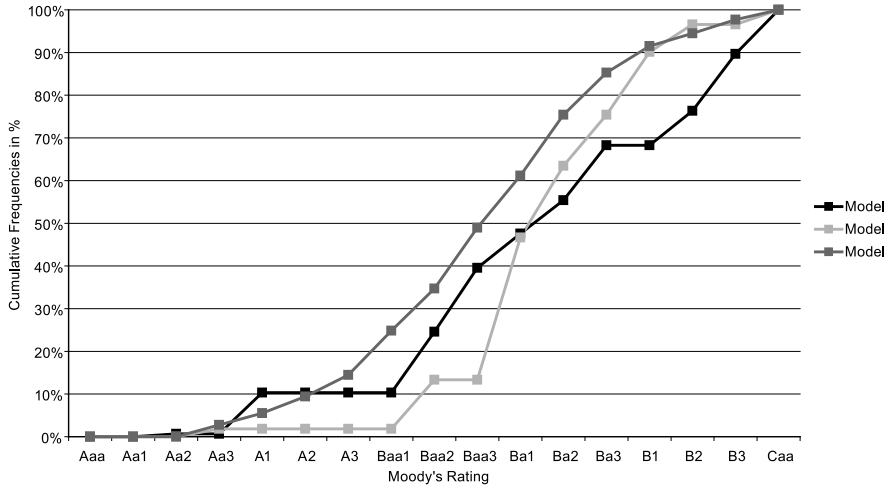


Figure 4 leads to the assumption that the three cumulative distribution functions are correlated. Following Bravais-Pearson (under the assumption that the data of more than 400 observations is metric) and Spearman (non-parametric), this assumption is tested by calculating the relevant correlation. In both cases, the correlations are well within the 0.01-quantile.

Furthermore, Figure 4 predicts that the empirical results of Model 3 do not originate from the same distribution as the results of Models 1 and 3. The outcomes of Models 1 and model 2 stay constantly below those of Model 3 (except the distribution tails). In addition, the outcomes of Models 1 and 2 are changing with lower rating classes: Model 1's figures increase rapidly for high rating classes, but starting at Ba1 the slope slows and Model 2's outcome simultaneously increases significantly. This shows that Model 2 incorporates higher cumulative frequencies for the rating classes at the lower end.

In order to derive statistical significant evidence for the distribution of the three rating outcomes, we compare the data basis pairwise by performing a Wilcoxon rank-sum-test (WRS-test). This test is a non-parametric statistical test, which can be applied to dependent samples like ours. We test our null hypothesis, which states that the two samples descend from the same, unknown distribution. Our results show that the null hypothesis can be indeed rejected in all three pairwise comparisons on an 0.01 level. The distributions of the rating outcomes of the three models do not descend from the same distribution, even if they are positively correlated.

4.2. H_2: Inclusion of qualitative information leads to significantly better ratings compared to ratings solely based on quantitative information.

To test Hypothesis H_2 we use pairwise comparisons of the three models. First, we evaluate the match of outcomes in each rating class. Second, by comparing the rating of one model for a specific SME with the rating of a second model for the same SME, we display the number of discrepancies for each rating class. If we link these discrepancies to the different characteristics of the rating models, we can evaluate the impact of qualitative and quantitative factors on the rating classification. For reasons of clarity, only rating classes are included for which at least one rating exists in either model. Therefore, the following tables of the pairwise comparisons incorporate a varying number of rating classes.

4.3. Comparison Model 1 vs. Model 2

A comparison of the rating outcomes of Models 1 and 2 is summarized in the following table:

Table 1: Comparison Model 1 / Model 2

	Model 1												
Model 2	Aa2	Aa3	A1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa	
Aa2													0
Aa3					1			7					8
A1													0
Baa2	1		17	10	11	3	4			3		1	50
Baa3													0
Ba1	2		18	39	29	14	15	7		11	7	3	145
Ba2			3	8	12	6	5	14		7	13	5	73
Ba3			3	1	4	4	5	11		6	12	6	52
B1			1	4	4	6	4	8		5	14	18	64
B2					3	2	1	7		2	4	9	28
B3													0
Caa					1			2		1	8	3	15
	3	0	42	62	65	35	34	56	0	35	58	45	435

As shown in Section 2.1, the two models differ mainly in the way they integrate or attribute weights of the qualitative factors. The comparison of the bank-specific approach of Model 1 with the far more complex criteria approach of Model 2 shows that "higher" rating outcomes of Model 1 (rating classes Aa2–Ba1) are almost always rated "lower" in Model 2. At the same time, the "lower" rated SMEs of Model 1 (rating classes Ba2–Caa) are predominately rated "higher" in Model 2. Conversely, corporates rated by Model 2 with a rating in the upper half of the rating scale are rated slightly higher by Model 1, whereas the ratings of the lower half of the rating scale (as attributed by Model 2) are rated marginally lower:

In case of low classifications in the quantitative rating section, the impact of qualitative factors decreases accordingly in Model 2 (see section 4.2). Indeed, for the lowest rating classes, only quantitative factors are incorporated in the risk classification. Model 1 on the other hand does not change the weight of the qualitative factors and leaves them at the same level for all rating classes. Apparently, the lower weights of quantitative factors in case of low rating classes do not result in the expected lower rating classification in comparison

to Model 1. Therefore, on the basis of the comparison performed between Model 1 and Model 2, Hypothesis H_2 cannot be confirmed.

Table 2: Summary Comparison Model 1 / Model 2

	Assessment by **Model 1**	
by **Model 2**	1st half of rating scale (Aa2–Ba1)	2nd half of rating scale (Ba2–Caa)
higher	15	171
lower	168	36
equal	24	21

	Assessment by **Model 2**	
by **Model 1**	1st half of rating scale (Aa2–Ba1)	2nd half of rating scale (Ba2–Caa)
higher	135	69
lower	112	74
equal	24	21

4.4. Comparison Model 1 vs. Model 3

A comparison of the hybrid Model 1 with Model 3, which in contrast is exclusively based on quantitative data input, leads to a quite similar picture as already seen in Table 1.

Table 3: Comparison Model 1 / Model 3

	Model 1															
Model 3	Aa1	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa	
Aa1																0
Aa3	1	9				2										12
A1	1	7				2				1		1				12
A2		4				7	4	1	1							17
A3	1	5				2	5	2	1	5			1			22
Baa1		4				15	14	7	1	3		1				45
Baa2		6				11	12	3	4			4	3			43
Baa3		5				18	10	7	9	6		4		2		61
Ba1		1				3	10	5	8	11		5	6	4		53
Ba2						1	5	8	7	13		10	15	4		63
Ba3						1	5	2	2	7		9	11	6		43
B1										4			11	12		27
B2		1							1				6	5		13
B3										5		1	3	5		14
Caa										1			2	7		10
	3	42	0	0	0	62	65	35	34	56	0	35	58	45	0	435

The quite positively rated corporates in Model 1 (Aa1–Baa3) predominantly receive lower rating classifications in the quantitative focused approach of Model 3. Model 3 in contrast allocates Model 1's rating classifications of the lower half of the rating scale significantly better. A similar picture is derived from Model 3's perspective: Estimations of Model 3 tend to be adjusted downwards by Model 1. This means that corporate entities receive comparably "lower" ratings in Model 1 throughout the entire rating scale than attributed by Model 3. This result in turn contradicts Hypothesis H_2, which states that the inclusion of qualitative information leads to a higher creditworthiness (rating class) in comparison to the rating outcome solely based on quantitative information.

Table 4: Summary Comparison Model 1 / Model 3

	Assessment by **Model 1**	
by **Model 3**	1st half of rating scale (Aa1–Baa3)	2nd half of rating scale (Ba1–Caa)
higher	49	156
lower	115	40
equal	43	32

	Assessment by **Model 3**	
by **Model 1**	1st half of rating scale (Aa1–Baa3)	2nd half of rating scale (Ba1–Caa)
higher	72	83
lower	96	109
equal	43	32

4.5. Comparison Model 2/Model 3

Finally, the third comparison of our sample portfolio rests upon the results of Model 2 and Model 3. In the course of this analysis, we compare a hybrid model, which varies in the qualitative factor weights over the different rating classes (Model 2) with a solely quantitative focused model (Model 3).

Again, the results show a complete different picture as assumed under Hypothesis H_2. Despite the inclusion of qualitative factors (up to rating class Baa2), Model 2 generates a significantly lower rating than in Model 3 over almost all rating classes. Only the lower ratings starting at Ba3 seem to confirm Hypothesis H_2. But we have to acknowledge that particularly in these rating classes and also in Model 2, the impact of the qualitative factors leans towards zero. On the basis of this argument, we have to reject Hypothesis H_2.

Table 5: Comparison Model 2 / Model 3

	Model 2														
Model 3	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa	
Aa3						3		8		1					12
A1	1					4		5	2						12
A2						5		10	2						17
A3	4					7		8	3						22
Baa1						11		29	4						44
Baa2						10		20	8	2	2			1	43
Baa3	1					5		31	16	4	3	2			62
Ba1	2							13	10	10	13	3		2	53
Ba2						3		17	12	12	13	4		2	63
Ba3						2		4	11	12	8	5		1	43
B1									5	5	12	3		2	27
B2										5	6	1		1	13
B3										1	3	7		3	14
Caa											4	3		3	10
	8	0	0	0	0	50	0	145	73	52	64	28	0	15	435

Table 6: Summary Comparison Model 2 / Model 3

	Assessment by **Model 2**	
by **Model 3**	1st half of rating scale (Aa3–Baa3)	2nd half of rating scale (Ba1–Caa)
higher	30	253
lower	18	71
equal	10	53

	Assessment by **Model 3**	
by **Model 2**	1st half of rating scale (Aa2–Baa3)	2nd half of rating scale (Ba1–Caa)
higher	11	78
lower	191	92
equal	10	53

5. Interpretation and Conclusion

1) The risk classification depends on the architecture of the rating model. The comparison of the results of the three rating models shows a surprisingly high number of deviations in risk classification, even though data input was identical. Not even half of the rating results (38–45%) are identical in the pairwise comparison or lie within a deviation of plus/minus one rating notch. Our results are therefore in line with earlier studies by Jacobson/Lindé/Roszbach (2006), who concluded – based on a Swedish data sample – that the quantification of credit risk does not only depend on the formal design of the rating model (e.g. number of rating classes), but is also influenced by a number of other parameters. An analysis by Carey, working with a similar approach to ours based on 20 US banks, showed that the models provide comparable results in 45% of the cases and in 95%, the deviations lie within a bandwidth of 2 rating notches (Carey (2002)). Our Hypothesis H_1 states that different architectures lead to significantly different ratings and can therefore be confirmed. This result, can, however be influenced by a variety of factors. The models measure the same risk. However, they are different in terms of e.g. weighting of qualitative and quantitative criteria, weighting of the different factor groups (sum of the quantitative and qualitative factors), calibration with regard to historical loss data, default event definition and transformation of ratios into scores.

2) The result discussed under 1 may lead to rating arbitrage. Borrowers, who are aware of the consequences of different rating model architectures may increasingly arbitrage rating models against each other. The establishment of independent SME rating agencies and the acceptance of external rating agencies by regulators will support this development. For the bank the problem of adverse selection effects arises. Ultimately, from a macroeconomic perspective, the question arises as to how and whether scarce capital resources can be attributed efficiently to risky projects. In a comparable analysis for rating models used by rating agencies when rating securitization transactions, it was established that the danger of arbitrage due to different rating model architectures is substantial (Fender/Kiff (2005)).

3) The inclusion of qualitative factors does not lead to a systematic rating improvement in the sense of a higher risk classification. This result of our empirical study contrasts existing literature. One possible reason for

this could be that the application of the base rating in Model 2 based on quantitative criteria is very strict (see details in section 4.2). The qualitative ratings may have a positive impact on the subsequent assessment, but their influence is not strong enough to over-compensate the strict base ratings in comparison with Model 3. Following the model design (Model 2), the maximum class reachable based on the quantitative assessment is 5 out of 10; the qualitative factors can only improve the overall rating to a Class 3 at the highest. Therefore, it is not possible to reach a better result than models basing their assessment on quantitative factors only, even though qualitative factors may contribute positively. When interpreting the results of our analysis, it should be considered that we looked at the rating models as a black box (except for the very basic elements of the architecture). Therefore, the direct correlation of the rating results with individual factor groups (quantitative/ qualitative) is difficult to extract and attribute to the model architecture. The description of the model architecture in section 2.1 may lead to the assumption that the models vary substantially with regard to discriminatory power and sophistication. Independently of the inclusion and weight of qualitative factors, this may lead to a different distribution across rating classes. An additional explanation inherent in the model architecture could be a differentiation of factor weighting in dependence of the rating class (e.g. extreme capital ratios can lead to unproportional deterioration of risk assessment in Model 1). A third potential explanation could be a positive correlation of quantitative and qualitative factors in Model 1. i.e. low quantitative scores trigger negative assessment of qualitative factors and unproportionally increase the “downgrading”. That would result in a systematic bias of both good and bad risk assessments.

Our analysis shows that it is not only the choice of the rating model (quantitative versus qualitative models) but rather the detailed design of the model architecture that appears to be responsible for deviating risk classifications.

6. Summary/Outlook

We used three different rating models by banks to rate a real credit portfolio from a commercial bank in Switzerland consisting of 435 representative Swiss SMEs from one region, well diversified across industries, age of the company and size. For each counterparty a real-life dataset of quantitative (as taken from balance sheet and income statements) and qualitative (non-public information as gathered by the respective credit officer) data from several consecutive years was available. Therefore, all counterparties could be rated with all three rating systems at a certain point in time between May 2005 and June 2006.

The various rating models result in 1-year PDs calibrated for the respective rating classes. We mapped the PDs on the official Moody's rating scale, so that rating results of different models could be compared. To interpret the results, we worked with histograms, pairwise comparisons and cumulative distribution functions, as well as tested correlation and independency of distributions by respective statistical tests.

The models used measure the same risks. However, due to the different architectures, different calibration of the models and different weighting of qualitative data, the differences in ratings differ substantially. Hypothesis H_1 can therefore be confirmed.

The tested rating models differ in particular with regard to the weighting of the qualitative data and criteria. A pairwise comparison of the rating results of the models shows that the inclusion of qualitative factors does not lead to a systematically better rating result. Hypothesis H_2 is therefore to be rejected. This result is in contrast to the findings of earlier studies.

The results of our analysis have interesting impacts, mainly in an environment where external ratings become more important under Basle II, both internal and external ratings become more transparent to better-informed borrowers and competition increases in the overall rating sector. If, as shown above, risk classifications of SME loans depend significantly on the architecture of the rating model, this could lead to rating model arbitrage against banks. If SMEs are aware of systematic pricing mismatches triggered by different rating models applied, rating shopping could be an issue. Furthermore, based on

our empirical findings, the role of qualitative factors in the statistical ratings needs to be analyzed in more depth in future research.

Additionally, a thorough analysis of the factors which influence the fact that different model architectures lead to significantly different rating assessments would be an interesting research topic. Another field of interest would be the validation of rating models with different architectures in an analysis across models.

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