Demand for debt and equity before and after the financial crisis.

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Abstract

Abstract: Supply and demand responses to financial crises result in fluctuations in credit flow to the private sector. Policy makers concerned with the sustainability and growth of viable firms should disaggregate these responses. Utilising firm level data, this study investigates characteristics of firms applying for external finance before and after the financial crisis, along with characteristics of successful applicants. Notwithstanding changes in credit conditions, salient features of external financing demand endure across the period, including ownership, asset structure, age and size. Failure to secure debt in an earlier period does not deter firm owners from applying for loans in a subsequent period. Evidence suggests that the most financially distressed firms are suffering the greatest consequences of the credit crunch.

Keywords: SME Finance, Discouraged borrowers, Credit crunch, Procyclical lending, Sectoral differences.

1. Introduction: Adequate resourcing of small and medium sized enterprises (SMEs) is of paramount importance because of their contribution to gross value added (GVA) and employment (Ayyagari et al. 2007). Provision of resources to small firms is a function of the willingness of funders to lend, combined with demand for investment finance. The preferred primary source of finance for small firms is internal equity, as they typically adhere to the pecking order theory (Mateev et al, 2013). If this source is inadequate for investment needs, firms seek finance externally, of which the most important source is bank debt (Beck et al., 2008). Reliance on bank finance causes SMEs to be particularly vulnerable if there is an abrupt and extensive disruption to the world financial system resulting in a credit crunch (Udell, 2009). Exposure to adverse effects of a credit crunch is intensified as small firms generally do not have diversified sources of external funding (Vos et al., 2007). It is further increased if a credit crunch is preceded by a period of expanded credit, during which firms may become reliant on debt finance (Hughes, 1997), and consequently accumulate large debt to assets ratios. The impact of tightened credit conditions may have a greater impact on firms in a poor liquidity position facing into the credit crunch (Mach and Wolken, 2012). This liquidity position is exacerbated if the credit crunch coincides with an economic recession, which can have a detrimental effect on activity in the real economy.

Economic recession also results in a reduction in demand for finance from firms as they reappraise and delay investment decisions. Furthermore, firms contribute to the contraction in private credit flow by deleveraging (ECB, 2012). Thus, it is unclear to what extent the reduction in private sector credit is a result of supply or demand side responses to financial and economic shocks. Nonetheless, governments worldwide promote supply side measures to increase the flow of credit to businesses. Whether such intervention is justified or necessary, governments persist with programmes such as the Merlin agreement in the UK (HCBIS committee, 2011), and the Small Jobs Act 2010 in the US.

Successive reports by central banks worldwide (e.g. CBoI, 2010, 2011, ECB 2012) suggest that total lending to SMEs in the period following the financial crisis declined significantly as the economic recession persisted. This reduction in credit may have been the result of prudent lending, as lenders decline loans to firms that represent a poor credit risk, the number of which typically increase during recession. Additionally, the large decline in lending to sectors that experienced a severe adverse shock may also be justified due to significant overcapacity. Having incurred significant losses, and facing greater capital reserve requirements and a need to shrink their balance sheets, the primary issue for banking institutions was to retain capital and bolster capital adequacy ratios (Honohan, 2009).

The recent financial crisis provides a valuable opportunity to assess the borrowing behaviour of firms in a period of expanding credit followed by a period of restricted lending. It also provides an opportunity to examine differences in the lending behaviour of financial institutions in a period of credit expansion, followed by credit contraction. Whilst a number of studies and reports provide valuable information about the financing environment for SMEs in the aftermath of the financial crisis (e.g. OECD 2009), a greater understanding of microeconomic issues can be gained by examining characteristics of firms seeking debt and equity finance, and identifying characteristics of successful applicants. This is important in order to examine if a particular type of firm reduces demand as the economy enters recession, or experiences a financing gap as credit conditions tighten. This information is valuable for policy makers attempting to mitigate the adverse effects of reduction in the supply of finance, along with reduced investment from the private sector.

This study aims to address these contemporary issues and add to the literature by investigating firm owners' applications for debt and equity before and after the financial crisis. Analysing firm level data collected from a representative sample of Irish SMEs, the study poses the following research questions: (a) are the profiles of firms seeking debt and equity finance significantly different after the financial crisis?; (b) does denial of credit in a preceding period result in discouragement to apply for

loans in following period?; and (c) are the profiles of firms receiving debt finance different after the financial crisis?.

This paper proceeds as follows: In the following section, the literature relating to demand and supply of finance for SMEs is briefly reviewed, and hypotheses are formulated. Description of data, variables employed, regression models and method of analysis are described in sections 3 and 4. This is followed by presentation and discussion of results. Conclusions are then elaborated, followed by suggestions for firm owners and policy implications.

2. Theoretical review and formulation of hypotheses

The ability of SMEs to access finance is a recurrent subject in the literature, and the recent proliferation of studies on the issue is motivated by the effect of the financial crisis on small firms (e.g. Cosh et al., 2009, Fraser, 2009, Dennis, 2010). Although credit flow to the private sector is a function of demand and supply, these issues have traditionally been addressed separately in the literature. Demand-side studies typically examine personal and firm characteristics in seeking to provide explanations for observed financing patterns, and although empirical evidence varies a number of stylised facts have emerged. For example, combined evidence suggests that the pecking order theory holds for small firms (Mateev et al, 2013). Notwithstanding temporal changes in financing markets for SMEs, firm characteristic determinants may be expected to have a similar effect on loan demand and supply across all periods. In fact, it is proposed that firm characteristic effects may be even more pronounced because of procyclical lending behaviour by financial institutions (Ruis et al., 2009). Supply-side studies concern the efficiency of financial markets in providing adequate resources for SMEs. These studies predominantly address the provision of debt finance to the sector, and may be classified into two opposing theories. Stiglitz and Weiss (1981) propose that there is insufficient supply of debt to small firms, and the resulting underinvestment means that equity is the equilibrium source of finance. Alternatively, De Meza and Webb (1987) contend that overlending results in investment in excess of socially efficient levels, and therefore debt is the equilibrium source of finance. This broad literature forms the basis for hypotheses formulated in the following review.

The external financing requirement of a firm depends on its growth opportunities, and whether they can be funded from internal resources. This may, in turn, depend on the stage of development, which is closely linked with the age of the enterprise. The most important source of finance in the early stages are personal resources of the firm owner, friends and family, which typically constitute the greatest part of capital structure at start-up (Mac an Bhaird and Lucey, 2011). These resources are commonly supplemented by short-term debt, but may also include long term loans which are often secured on the personal assets of the firm owner (Mac an Bhaird and Lucey, 2010). Younger firms have difficulty accessing debt, however, because of a lack of credit history (Diamond, 1989, Sánchez-Vidal and Martín-Ugedo, 2012). Additionally, smaller firms have relatively greater agency costs, and consequently greater costs of alleviating information asymmetries due to economies of scale (Bartholdy and Mateus, 2008, Daskalakis and Psillaki, 2008). Furthermore, debt finance may not be appropriate, sufficient or available for various categories of firms (e.g. fast growth high-tech enterprises), and these firms typically seek finance in equity markets. This is particularly true for fast growth firms lacking collateral in the form of fixed assets with a requirement for large amounts of equity. These considerations give rise to the following hypotheses:

H1: *Smaller and younger firms have a greater demand for debt and equity finance*

H2: High growth firms have a greater demand for debt and equity finance

H3: Gazelles have a greater demand for equity finance

Another factor to take into account when investigating demand for finance is the firm owner's preference for debt or equity. This is influenced by a number of requirements and considerations,

including ownership and managerial independence, which is one of the principal requirements for small firm owners (Poutziouris, 2003). Firm owners with this motivation eschew equity finance from outside investors, and use internal equity (Hirsch and Walz, 2011), resorting to bank funding if external finance is required. The need for control and independence is often determined by the legal form of the firm, as firms in closely held ownership (such as sole proprietorships, partnerships and family firms) are less likely to apply for external equity from new sources than firms in wider ownership (Poutziouris, 2002). By extension, firms seeking equity finance from new external investors are unlikely to apply for debt finance, and vice versa. Of course this may not be true for cash constrained firms, for whom survival rather than control is a first order concern. For some firms, indifference to debt or equity increases during times of financial crisis and economic recession, as liquidity becomes increasingly problematic. These issues give rise to the following hypotheses:

H4: Closely-held firms have a greater demand for debt finance and a lesser demand for equity finance

H5: Firms applying for loan finance will not apply for external equity in the same period

Whilst reluctance to apply for debt finance is a consideration for firm owners seeking to retain control of the firm, an additional factor is discouragement related to perceived refusal of the requested funding (Kon and Storey, 2003). The level of discouragement is difficult to ascertain from secondary datasets, as discouraged borrowers simply do not apply for loans. One measure that can be employed, however, is whether firms have previously been refused debt finance. Firms that have been declined intermediated debt in times of expanded credit are likely to be even more discouraged in times of restricted credit. Therefore, it is hypothesised that:

H6: Firms that have previously been refused loan funding will not apply for debt in a subsequent period

Another factor that influences demand for debt and equity financing is the sector in which the firm operates. This is primarily due to differences in asset structure across sectors, and may also result from temporal differences in investment patterns. Previous studies have provided empirical evidence that industry sector influences capital structure (Hall et al., 2000, Brierley and Kearns, 2001), although other studies emphasise the primacy of firm specific effects (Jordan et al., 1998). This evidence suggests the hypotheses:

H7: Firms in sectors typified by tangible assets apply for debt rather than equity finance

H8: Firms in sectors typified by intangible assets apply for equity rather than debt finance

The hypotheses generated above apply to the demand side of small firm financing, and it is suggested that the proposed effects are intensified in times of recession. For example, smaller and younger firms will likely have an even greater demand for finance during recession than their older, more mature peers which may have greater retained earnings to rely on. Similarly, the effect of discouragement is likely to be intensified as lending restrictions increase.

On the opposite side of the debt contract, financial institutions are primarily concerned with the repayment of the capital sum plus interest. The difficulty with loan contracts is the imbalance in the structure of payoffs. If the borrower's project does not succeed, the bank loses the full capital amount; whereas if the borrower makes exceptional returns, the bank receives a fixed margin (interest rate) plus capital, and the borrower retains the profits. Financial institutions seek to safeguard against these potential losses by employing a number of lending techniques. Primary among those are asset-based lending and relationship lending. Younger firms generally experience greater problems with information opacity, and may have difficulty in accessing debt. As a firm becomes established and develops a trading and credit history, reputation effects alleviate the problem of moral hazard (Diamond, 1989), facilitating borrowing capacity. Furthermore, it may be relatively more costly for smaller firms to resolve information asymmetries with banks, and consequently smaller firms may be

offered less debt capital, or capital at higher costs than larger firms (Cassar and Holmes, 2003). These considerations give rise to the hypothesis:

H9: Younger, smaller firms are less successful in loan applications

Previous studies find that growth, particularly high growth, is positively related to the proportion of external financing employed (Gompers and Lerner, 2003). Although access to finance is not without difficulty for high-growth firms (Becchetti and Trovato, 2002), financial institutions appear to be favourable to resourcing a firm with growth prospects. This is supported by a number of studies reporting a positive relationship between growth and debt ratios (Johnsen and McMahon, 2005, Sogorb Mira, 2005, Daskalakis and Psillaki, 2008). It is proposed that

H10: High growth firms are more successful in loan applications

The asset structure of the firm has a significant bearing on the means of external finance employed, primarily because banks employ asset-based lending techniques when advancing debt to overcome potential agency problems of moral hazard. Collateral provides funders with security in the event of default, with maturity of the asset typically matching maturity of the debt. Indeed, Bartholdy and Mateus (2008) contend that asset structure is the single most important determinant of SME capital structures. Thus, it is proposed that

H11: Sectors typified by tangible assets are more successful in loan applications

The previous three hypotheses relate to the supply-side of SME financing, and are generally applicable in all prevailing macroeconomic conditions. Once again, the proposed relationships are likely to be even more acute in the aftermath of the financial crisis. Storey and Greene (2010) relate that rejection rates for term loans soared from 7.4% in the pre-recessionary period to over 16% in 2008. Therefore, it is expected that younger, smaller firms will be even less successful in loan applications in the post-financial crisis period, for example.

3. Data Collection and Description of Variables

Data for this study was collected by the Irish Central Statistics Office (CSO) as part of a Eurostat project to examine issues related to access to finance by SMEs across the European Union. Survey data collected related to respondents' loan and equity applications in 2007 and in 2010, and whether they were successful, partially successful or unsuccessful in applications to a variety of sources. The sample of businesses surveyed comprised independent firms in non-financial sectors employing between 10 and 249 persons in the year 2005, and continuing to employ at least 10 persons at the time of the survey. The sample was selected from NACE Rev 2 categories B to E (industry), F (construction), G, H, I, L, N (selected services), J (ICT services), and M (professional, scientific and technical services). The target population was divided into strata according to NACE groups and growth categories. Growth is categorised in three groups, 'gazelle', 'high growth' and low growth'. 'High growth' enterprises attained increases of 20% per annum in employment over the period 2005 to 2008. 'Gazelles' were defined as high growth enterprises established between 2003 and 2005, and 'non high growth' included all other enterprises. These firms appear in all sectors, with over 50% occurring in the services sectors. For strata with less than 75 enterprises, and for gazelles, a census was conducted. The rest of the sample was selected using proportional allocation. The survey was issued in September 2010, and closed in February 2011. Total sample size was 3,000 enterprises, and a response rate of 28% yielded 829 respondents.

Variables selected to examine changes in characteristics of firms applying for, and receiving debt and equity finance before and after the financial crisis are described in table 1. As the questionnaire was addressed to firms in 2010, with retrospective questions about 2007, it is a balanced dataset. Nonetheless, it is not possible to observe firms that have not survived in the intervening period. As these firms may have been financially distressed, credit rejections for 2007 may be understated, and

there remains an issue of survivorship bias. Additionally, effects related to discouraged borrowing may be understated as this cannot be directly observed, and previous loan refusal may not be an efficient proxy.

Table 1. Definitions and descriptive statistics of dependent and independent variables.

Variable name	Definition	mean	St. dev.	N
Dependent variables				
Apply loan 2007	1 if firm applied for debt; 0 otherwise.	0.372	0.484	866
Apply loan 2010	1 if firm applied for debt; 0 otherwise.	0.307	0.462	866
Apply equity 2007	1 if firm applied for equity; 0 otherwise.	0.033	0.180	866
Apply equity 2010	1 if firm applied for equity; 0 otherwise.	0.043	0.202	866
Bank Success 2007	1 if firm's loan application successful; 0 otherwise.	0.314	0.464	866
Bank Success 2010	1 if firm's loan application successful; 0 otherwise.	0.154	0.361	866
Independent variables				
Gazelle	1 if firm was high growth and established between 2003 and 2005; 0 otherwise.	0.091	0.288	866
High growth	1 if firm had an increase of 20% per annum in employment from 2005 to 2008; 0 otherwise.	0.188	0.391	866
Low growth	1 if firm was not 'high growth' or 'gazelle'; 0 otherwise.	0.721	0.449	866
Sizeclass	1 if firm has 50 – 250 employees; 0 otherwise.	0.154	0.361	866
Lnage	Natural log of the age of the firm from incorporation / establishment.	2.860	0.644	842
Own	1 if firm is sole proprietorship or partnership; 0 otherwise	0.157	0.364	851
Bankfail 2007	1 if a firm applied for, but failed to secure a bank loan in 2007; 0 otherwise	0.006	0.076	866
Sectoral dummy variables				
Industry	1 if NACE Rev 2 is B to E; 0 otherwise	0.142	0.349	866
Construction	1 if NACE Rev 2 is F; 0 otherwise	0.094	0.291	866
Selected Services	1 if NACE Rev 2 is G, H, I, L, N; 0 otherwise	0.561	0.497	866
ICT Services	1 if NACE Rev 2 is J; 0 otherwise	0.080	0.271	866
Professional, scientific and other services	1 if NACE Rev 2 is M; 0 otherwise	0.124	0.329	866

4. Method of Analysis

Research questions posed in this study were empirically tested using probit regression models with selection, which are expressed as a function of the characteristics:

$$Y = \beta_0 + \beta_1 GAZELLE + \beta_2 HIGHGROWTH + \beta_3 SIZECLASS + \beta_4 LNAGE + \beta_5 APPLYEQUITY/APPLYLOAN + \beta_3 OWN + \varepsilon \quad (1)$$

The binary choice probit model represents the probability that Y=1 for each given characteristic, i.e. the probability of a firm applying for (or receiving) finance in each period. Probit regression models with selection were estimated (Dubin and Rivers, 1989), as a significant number of respondents did not apply for finance in either period. Similarly, models examining success in accessing debt finance included only those respondents requesting bank loans. The model was estimated using maximum likelihood estimation (MLE), as normal distribution was assumed. Since probit model coefficients cannot be interpreted the same as ordinary least squares coefficients, marginal effects are estimated and reported in tables 2 and 3. Examination of Pearson correlation coefficients and variance inflation factors indicate that multicollinearity is not an issue.

Hypotheses related to discouraged borrowers were tested by inclusion of the variable 'Bankfail 2007' in models related to bank applications in 2010:

$$Y = \beta_0 + \beta_1 GAZELLE + \beta_2 HIGHGROWTH + \beta_3 SIZECLASS + \beta_4 LNAGE + \beta_5 APPLYEQUITY/APPLYLOAN + \beta_3 OWN + \beta_5 BANKFAIL2007 + \varepsilon \quad (2)$$

Sectoral differences in requests for, and success of financing applications included four dummy variables, Industry, Selected services, ICT Services, and Professional, Scientific and Technical Services. Construction was selected as the reference sector in models estimated with industry dummy variables. The capital structure of the construction sector is markedly different from other sectors, primarily because of variations in asset structure. Additionally, expansion of the construction sector before the financial crisis (Gurdgiev et al., 2011) makes it an important reference group when investigating sectoral-specific differences in financing during this period.

5. Results

Marginal effects and coefficients of probit multivariate regressions relating to financing applications are reported in tables 2 and 4 (appendix A) respectively. Gazelles and high growth firms were more likely to apply for debt finance than low growth firms in 2007, as were high growth firms in 2010. High growth firms were also more likely than low growth firms to apply for equity finance in both periods, although surprisingly results for gazelles are insignificant. Firm size was positively related with the probability of applying for loans in 2010. Age was positively related with loan applications in 2007. These results lead to rejection of the hypothesis that smaller, younger firms have a greater demand for debt finance. The probability of a respondent applying for debt was positively related to equity applications, and vice versa. Businesses with a sole proprietorship or partnership legal form had a greater probability of applying for bank finance than other limited liability firms in both periods. Firms with a wider form of ownership are more likely to apply for equity before the financial crisis. These results lead us to accept and reject hypotheses 4 and 5 respectively. Failure to secure a bank loan in 2007 is strongly related with the probability of applying for loan finance in 2010, indicating that firms denied loans in previous periods are not discouraged from making subsequent applications. There are a small number of significant sectoral differences in financing applications in both periods. Firms in the construction sector were more likely to apply for intermediated debt than ICT services firms in 2007. Similarly, firms in ICT services and the Professional, Scientific and Technical Services sectors were more likely to apply for equity finance than firms in the construction sector in 2007.

Table 2. Probit models for demand for finance: Marginal effects.

	Model 1		Model 2		Model 3		Model 4	
	Apply Loan 2007		Apply loan 2010		Apply Equity 2007		Apply Equity 2010	
Firm-characteristic variables								
Gazelle	0.143** (0.066)	0.126** (0.067)	0.095 (0.065)	0.088 (0.065)	0.002 (0.014)	0.005 (0.015)	0.004 (0.023)	0.002 (0.022)
Highgrowth	0.132*** (0.048)	0.134*** (0.048)	0.086** (0.046)	0.086** (0.046)	0.024* (0.015)	0.015 (0.013)	0.048** (0.023)	0.044** (0.022)
Sizeclass	0.028 (0.049)	0.028 (0.050)	0.090** (0.049)	0.091** (0.049)	-0.000 (0.009)	0.001 (0.008)	-0.015 (0.012)	-0.013 (0.012)
Lnage	0.068** (0.029)	0.058** (0.029)	0.015 (0.027)	0.011 (0.028)	-0.006 (0.006)	-0.004 (0.006)	-0.001 (0.009)	-0.002 (0.009)
Applyequity / Applyloan	0.503*** (0.068)	0.523*** (0.065)	0.382*** (0.082)	0.383*** (0.083)	0.063*** (0.015)	0.063*** (0.016)	0.074*** (0.019)	0.073*** (0.019)
Own	0.104** (0.049)	0.112** (0.054)	0.120*** (0.049)	0.134*** (0.053)	-0.018*** (0.007)	-0.018*** (0.006)	-0.006 (0.014)	-0.001 (0.017)
Bankfail 2007			0.433* (0.231)	0.431* (0.228)				
Sectoral dummy Variables								
Industry		-0.030 (0.069)		-0.031 (0.065)		0.015 (0.023)		0.014 (0.027)
Selected Services		-0.085 (0.060)		-0.041 (0.057)		0.006 (0.012)		-0.008 (0.019)
ICT Services		-0.236*** (0.059)		-0.087 (0.069)		0.055 (0.052)		0 .014 (0.032)
Professional, Scientific and Technical Services		-0.100 (0.071)		-0.077 (0.067)		0.049 (0.047)		-0.006 (0.021)

Multivariate probit regressions with selection are estimated in all cases. *, **, *** implies significance levels of 10%, 5% and 1% respectively. Standard errors in parentheses.

Marginal effects and coefficients of probit models investigating the probability of success in bank finance applications in 2007 and 2010 are reported in tables 3 and 5 (appendix A) respectively. Success in receiving the requested loan in the period preceding the financial crisis is primarily determined by the size and age of the firm. Sectoral differences in securing finance were not significant in the pre-crisis period. The probability of receiving loan finance in 2010 was negatively related with applications for equity. This suggests that firms seeking investment from multiple sources have a more acute financial requirement, and consequently a lower probability of securing the loan finance requested. The most notable feature of post-financial crisis lending is sectoral differences. Firms in the construction sector have a much lower probability of securing loan finance than firms in all other sectors.

Table 3. Probit models for 'success in obtaining bank loans': Marginal effects.

	Model 5		Model 6	
	Bank Success 2007	Bank Success 2007	Bank Success 2010	Bank Success 2010
Firm-characteristic Variables				
Gazelle	0.007 (0.066)	-0.002 (0.068)	0.103 (0.110)	0.103 (0.113)
Highgrowth	-0.022 (0.051)	-0.013 (0.051)	-0.066 (0.080)	-0.082 (0.081)
Sizeclass	0.123*** (0.037)	0.116*** (0.038)	0.041 (0.084)	0.040 (0.086)
Lnage	0.063* (0.033)	0.059* (0.033)	-0.001 (0.054)	0.002 (0.056)
Applyequity / Applyloan	-0.112 (0.089)	-0.114 (0.090)	-0.282*** (0.092)	-0.293*** (0.093)
Own	0.042 (0.047)	0.058 (0.048)	-0.051 (0.081)	-0.059 (0.093)
Sectoral dummy Variables				
Industry		0.065 (0.060)		0.303*** (0.11)
Selected Services		0.011 (0.063)		0.206** (0.109)
ICT Services		-0.068 (0.125)		0.341*** (0.115)
Professional, Scientific and Technical Services		-0.041 (0.095)		0.245* (0.131)

Multivariate probit regressions with selection are estimated in all cases. *, **, *** implies significance levels of 10%, 5% and 1% respectively. Standard errors in parentheses.

6. Discussion

SME demand for external resources before and after the financial crisis reveals similarities in characteristics of applicant firms. Not unexpectedly, high growth firms have a greater requirement for debt and equity finance in both periods. Medium sized firms have a greater demand for intermediated debt than small firms in 2010. One interpretation of this result is that surviving larger firms came under greater liquidity pressure as the recession progressed, resulting in a greater requirement for debt finance. This effect is more severe for firms accustomed to financing growth with high levels of debt in the preceding period of expanded credit. Thus, effects of credit contraction are more severe on these larger firms. Older firms, on the other hand, had a greater demand than younger firms for debt finance in 2007. In 2010 they may have access to greater reserves than younger firms, and consequently demand for debt may have decreased.

Consistent with results in previous studies (Mac an Bhaird, 2010), closely held ownership is positively related with demand for debt and negatively related with demand for equity. This well established pattern is unchanged in both periods, although it would appear to be contradicted by positive

relationships between demand for debt and equity. These latter results may be explained by the fact that firms experiencing severe liquidity problems are more concerned with survival of the business than control or managerial independence. Contrary to hypotheses, failure to secure a bank loan in 2007 did not deter respondents to apply for loan finance in 2010. Although this result does not refute the 'discouraged borrowers' theory, as discouraged borrowers cannot be directly observed, it provides evidence that previous refusal does not enhance discouragement. In fact, the opposite effect is observed. This is particularly true when one considers that discouragement in the post-financial crisis period could be even greater because of evidence regarding reduced lending to SMEs (e.g. OECD, 2009).

A small number of significant results suggest sectoral differences in demand for debt and equity. In 2007 firms in the construction sector had a greater probability of applying for debt than firms in the ICT Services sector. One explanation for this result is that firms in the construction sector satisfy bank requirements for tangible assets to secure debt finance, and are therefore more likely to apply for debt than equity. Additionally, because of the boom in asset prices in the sector before the financial crisis, banks advanced increasing amounts of debt to construction firms (Honohan, 2009). This, in turn, resulted in further demand from firms in the sector. Equally, firms in sectors typified by intangible assets have a greater demand for equity finance throughout the period. In 2007, firms in ICT and Professional, Scientific and Technical services had a greater probability of applying for equity than debt finance. These results indicate that, even when there are significant changes in credit conditions, long established patterns of financing based on asset structure endure.

The probability of receiving intermediated debt during the pre-crisis period was not determined by growth, but by size and age. This result is not unexpected, as relationship-based lending and asset-based lending are two of the most commonly employed lending criteria employed by banks (Baas and Schrooten, 2006). It does, however, highlight the inefficiency of advancing debt finance on the basis of collateral rather than criteria such as growth or predicted cash flow. It also emphasises the inherent hazard to the lender of collateral-based lending policy, as in times of falling asset prices the residual value of the loan may not be fully covered by the collateral provided. This result provides a suggestion of the risks to Irish banks of a downturn in the value of collateral post 2007.

Two significant features of bank lending are evident in the period after the financial crisis. Firstly, firms applying for both debt and equity in the same year have a lower probability of securing loans. This suggests that firm owners indifferent to the source of funding, and possibly with a more acute or immediate financing requirement, are more distressed or constrained than borrowers not seeking equity in the same time period. This result may be explained by the denial of finance to the most distressed or constrained applicants. Secondly, there is considerable variation in lending across sectors. Firms in Selected services, Professional, Scientific, and Technical services, and ICT services are 21%, 25% and 34% more likely to receive loan finance respectively than those in construction. Firms in Industry have a 30% greater probability of success in loan applications than construction based firms in 2010. This result may be attributed to a severe decline in growth prospects for the sector due to considerable overcapacity of housing stock (Whelan, 2009). Additionally, it evidences the sharp turnaround in economic activity from 2007 when there was a much greater concentration in the construction sector.

A number of aspects of the demand for, and supply of finance are not addressed directly in this study, in the sense that they are not modelled in probit regressions. Firstly, it is difficult to ascertain to what extent changes in demand for finance have occurred because of reduced cash flow or lower profitability. It is, however, possible to gauge the severity of financial requirement by examining firms that apply for both debt and equity funding in the same period. Whilst theoretically it is proposed that firms have a preference for debt or equity, this may not be a first order concern for cash constrained firms. More concerned with survival, such firms may willingly accept finance from multiple sources. Thus, it can be reasonably suggested that firms applying for both types of funding in one period have

an acute need for finance. It is therefore not surprising that firms with a critical need for finance (as defined by making multiple finance applications) have a greater probability of being refused finance. Secondly, an increased financing constraint may arise from more onerous credit conditions, such as extra covenants or increased interest rates. Although these elements are not included in regression models, survey respondents do not perceive them as significant obstacles to growth and sustainability (CSO, 2011).

7. Conclusion

Access to external finance for SMEs in the aftermath of the financial crisis is a critical issue, as witnessed by the plethora of recent studies on the subject (e.g. Holton and O'Brien, 2011, Ullah et al., 2011). Reduction in the use of debt and equity by small firms is due to a combination of demand and supply side factors. Whilst funders are advancing less finance than in the previous period of expanded credit (OECD, 2009, BIS, 2012), demand for resources from SMEs has also decreased as the private sector reduces investment (Cosh et al., 2009), and at the same time deleverages. Analysis of demand for finance of a representative sample of Irish SMEs indicates that growth, ownership, age and size are important factors before and after the financial crisis. Notwithstanding a more challenging financing and business environment in the post crisis period, firm owners' financing preferences endure. This may not be true for firms in financial distress or experiencing liquidity pressure, however. Lending patterns indicate that firms applying for finance from multiple sources have difficulty in securing loans after the crisis, as do firms in the construction sector. Financial institutions are justified in refusing funding to firms which are a poor credit risk and in sectors with significant overcapacity, although they need to be consistent in credit appraisal, particularly during periods of credit expansion. In order to ameliorate the adverse effects of cyclical fluctuations in credit supply, lending criteria need to be consistently applied across all periods. It is of fundamental importance that lending decisions are made on the basis of investment appraisal, rather than asset-based techniques. Recent evidence suggests that reduced credit provision to the SME sector is a result of credit rationing rather than improved lending practices (McCann, 2011, Lawless and McCann, 2012), which does not bode well for small firms or lending institutions.

Although precise explanations for reduced use of external sources of finance by SMEs are not straightforward, governments worldwide have launched a number of high-profile supply side initiatives to address the 'problem'. Whilst these programmes are valued by small firms experiencing severe liquidity pressure through prolonged recession, policy measures should be more nuanced as it is unclear which firms are experiencing difficulties in accessing credit, or even if access to finance is the most pressing problem for small firms. In this way, policy makers can more effectively counteract the adverse effects of procyclical lending behaviour of financial institutions.

The experience of SMEs through the recent financial crisis emphasises the importance of financial management. Firms overly dependent on external financing are exposed to the adverse effects of a credit crunch, which is exacerbated if the firm has accumulated large debt in a preceding period of credit expansion. Exposure to external fluctuations of credit supply can be lessened through judicious financial management, which acts as an 'internal smoothing' technique. This is especially important during periods of economic expansion, when firm owners are not as constrained by external conditions.

Appendix A.

Table 4. Estimated probit regression coefficients for demand for finance models.

	Model 1		Model 2		Model 3		Model 4	
	Apply Loan 2007		Apply loan 2010		Apply Equity 2007		Apply Equity 2010	
Firm-characteristic variables								
Gazelle	0.366** (0.168)	0.323** (0.169)	0.259 (0.170)	0.241 (0.171)	0.046 (0.339)	0.140 (0.349)	0.059 (0.312)	0.035 (0.322)
Highgrowth	0.340*** (0.121)	0.346*** (0.123)	0.237** (0.124)	0.239** (0.125)	0.447** (0.214)	0.356 (0.225)	0.519*** (0.193)	0.496*** (0.197)
Sizeclass	0.074 (0.128)	0.073 (0.129)	0.248** (0.130)	0.251** (0.130)	-0.011 (0.241)	0.030 (0.246)	-0.250 (0.241)	-0.237 (0.244)
Lnage	0.179** (0.076)	0.152** (0.077)	0.043 (0.078)	0.032 (0.079)	-0.158 (0.164)	-0.121 (0.171)	-0.017 (0.135)	-0.024 (0.139)
Applyequity / Applyloan	1.442*** (0.296)	1.528*** (0.307)	0.998*** (0.228)	1.001*** (0.229)	1.067*** (0.221)	1.173*** (0.240)	0.787*** (0.169)	0.795*** (0.170)
Own	0.269** (0.125)	0.288** (0.136)	0.326*** (0.127)	0.364*** (0.138)	-0.787* (0.424)	-1.008** (0.479)	-0.088 (0.236)	-0.011 (0.253)
Bankfail 2007			1.147* (0.706)	1.142* (0.694)				
Constant	-1.038*** (0.237)	-0.739*** (0.276)	-0.841*** (0.242)	-0.690** (0.283)	-2.075*** (0.503)	-2.565*** (0.618)	-2.126*** (0.425)	-2.096*** (0.503)
Sectoral dummy Variables								
Industry		-0.081 (0.187)		-0.089 (0.192)		0.340 (0.408)		0.182 (0.315)
Selected Services		-0.225 (0.158)		-0.116 (0.162)		0.188 (0.370)		-0.113 (0.281)
ICT Services		-0.733*** (0.232)		-0.266 (0.226)		0.788* (0.443)		0 .184 (0.361)
Professional, Scientific and Technical Services		-0.275 (0.207)		-0.230 (0.213)		0.757* (0.441)		-0.103 (0.373)
N	829	829	829	829	829	829	829	829
Log likelihood	-523.557	-517.37	-490.845	-489.844	-104.358	-101.103	-132.330	-131.167
X^2	48.86	61.23	43.19	45.19	42.73	49.24	31.59	33.92
Sig.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Multivariate probit regressions with selection are estimated in all cases. The dependent variable in all models is a dummy variable, equal to 1 if the firm applied for finance, and 0 otherwise. *, **, *** implies significance levels of 10%, 5% and 1% respectively. Standard errors in parentheses.

Table 5. Estimated probit regression coefficients for 'success in obtaining bank loan' models.

	Model 5		Model 6	
	Bank Success 2007	Bank Success 2007	Bank Success 2010	Bank Success 2010
Firm-characteristic variables				
Gazelle	0.032 (0.309)	-0.009 (0.312)	0.260 (0.283)	0.259 (0.290)
Highgrowth	-0.096 (0.222)	-0.061 (0.228)	-0.167 (0.201)	-0.207 (0.206)
Sizeclass	0.736** (0.309)	0.688** (0.310)	0.103 (0.212)	0.100 (0.215)
Lnage	0.286* (0.154)	0.273* (0.155)	-0.003 (0.136)	0.005 (0.140)
Applyequity / Applyloan	-0.428 (0.293)	-0.436 (0.297)	-0.759*** (0.287)	-0.791*** (0.293)
Own	0.209 (0.251)	0.297 (0.278)	-0.129 (0.205)	-0.148 (0.233)
Constant	0. 152 (0.470)	0.138 (0.519)	0.094 (0.422)	-0.469 (0.509)
Sectoral dummy Variables				
Industry		0.341 (0.363)		0.808*** (0.334)
Selected Services		0.052 (0.289)		0.523* (0.284)
ICT Services		-0.277 (0.452)		0.958** (0.413)
Professional, Scientific and Technical Services		-0.175 (0.381)		0.641* (0.377)
No. observations	310	310	256	256
Log likelihood	-124.859	-123.416	-172.111	-168.057
X^2	14.09	16.98	10.67	18.78
Sig.	0.02	0.07	0.09	0.04

Multivariate probit regressions with selection are estimated in all cases. The dependent variable in all models is a dummy variable, equal to 1 if the firm's loan application was successful, and 0 if refused. *, **, *** implies significance levels of 10%, 5% and 1% respectively. Standard errors in parentheses.

Ayyagari, M, Beck, T. and Demirgüç-Kunt, A. (2007), Small and medium enterprises across the globe, *Small Business Economics* 29, 415-434.

Baas, T. and Schrooten, M. (2006) Relationship Banking and SMEs: A Theoretical Analysis. *Small Business Economics,* 27**,** 127-137.

Bartholdy, J. and Mateus, C. (2008), Financing of SMEs: An asset side story. Paper presented at the conference "Financing of SMEs in Europe", Société Universitaire Européenne de Recherches Financiéres, Palais du Luxembourg, Paris, 11-12 September.

Becchetti, L. and Trovato, G. (2002), The determinants of growth for small and medium sized firms. The role of the availability of external finance, *Small Business Economics,* 19, 291-306.

Beck, T., Demirguc-Kunt, A. and Maksimovic, V. (2008), Financing patterns around the world: Are small firms different?, *Journal of Financial Economics,* 89, 467-487.

Brierley, P. G. and Kearns, A. (2001) The Financing Patterns of New and Old Economy Firms in the UK Bank of England Discussion Paper. London: Bank of England.

Cassar, G. and Holmes, S. (2003), Capital structure and financing of SMEs: Australian evidence. *Accounting and Finance,* 43 (2): 123-147.

Central Bank of Ireland (2010), "Lending to Irish small and medium sized enterprises: Q1-Q3 2010", Information release, 14 December 2010.

Central Bank of Ireland (2011), "Trends in business credits and deposits: Q1 2011", Information release, 28 June 2011.

Central Statistics Office (2011), Access to finance, 2007 and 2010, Central Statistics Office, Dublin.

Cosh, A., Hughes, A., Bullock, A., and Milner, I. (2009), SME finance and innovation in the current economic crisis, Centre for Business Research, University of Cambridge, Cambridge.

Daskalakis, N. and Psillaki, M. (2008) Do country or firm factors explain capital structure? Evidence from SMEs in France and Greece. *Applied Financial Economics,* 18**,** 87 - 97.

De Meza, D. and Webb, D. C. (1987) Too much investment: A problem of asymmetric information. *The Quarterly Journal of Economics,* 102**,** 281-292.

Dennis, W. J. (2010), Small business credit in a deep recession, National Federation of Business (NFIB) Research Foundation, February 2010.

Department for Business and Skills (BIS) (2012), SME access to external finance, BIS Economics paper no. 16, London. http://www.bis.gov.uk/assets/BISCore/enterprise/docs/S/12-539-sme-access-external-finance.pdf

Diamond, D. W. (1989) Reputation acquisition in debt markets. *Journal of Political Economy,* 97**,** 828-862.

Dubin, J. A. and Rivers, D. (1989) Selection bias in linear regression, logit and probit models. *Sociological methods and research,* 18**,** 360-390.

European Central Bank (2012), *Survey on the access to finance of SMEs in the Euro area - October 2011 to March 2012*, European Central Bank, April 2012.

Fraser, S. (2009), Small firms in the credit crisis: Evidence from the UK survey of SME finances, Centre for Small and Medium-sized Enterprises, Warwick Business School, University of Warwick.

Gompers, P. A. and Lerner, J. (2003) Equity financing. IN Acs, Z. & Audretsch, D. B. (Eds.) *Handbook of Entrepreneurship Research. An Interdisciplinary Survey and Introduction.* Kluwer Academic Publishers.

Gurdgiev, C., Lucey, B., Mac an Bhaird, C., Roche-Kelly, L. (2011), The Irish economy: Three strikes and you're out?. *Panoeconomicus*, 58 (1), pp. 19-41.

Hall, G., Hutchinson, P. J. and Michaelas, N. (2000) Industry effects on the determinants of unquoted SMEs' capital structure. *International Journal of the Economics of Business,* 7**,** 297-312.

Hirsch, J. and Walz, U. (2011), Financing decisions along a firm's life-cycle: Debt as a commitment device, *European Financial Management,* 17 (5), 898-927.

Holton, S. and O'Brien, M. (2011), Firms' financing during the crisis: A regional analysis, Central Bank of Ireland, Quarterly Bulletin 01, January 2011.

Honohan, P. (2009) "Resolving Ireland's Banking Crisis". *The Economic and Social Review,* 40**,** 207-231.

House of Commons Business, Innovation and Skills Committee (HCBIS) (2011), Government assistance to industry: Government response to the committee's third report of session 2010-2011, HC 1038.

Hughes, A. (1997) Finance for SMEs: A U.K. Perspective. *Small Business Economics,* 9**,** 151-166.

Johnsen, P. C. and McMahon, R. G. P. (2005) Cross-Industry Differences in SME Financing Behaviour: An Australian Perspective. *Journal of Small Business and Enterprise Development,* 12**,** 160-177.

Jordan, J., Lowe, J. and Taylor, P. (1998) Strategy and Financial Policy in UK Small Firms. *Journal of Business Finance & Accounting,* 2**5,** 1-27.

Kon, Y. and Storey, D. J. (2003) A Theory of Discouraged Borrowers. *Small Business Economics,* 21**,** 37-49.

Lawless, M. and McCann, F. (2012), Credit access for small and medium firms: Survey evidence for Ireland, Research Technical Papers 11/RT/11, Central Bank of Ireland.

Mac an Bhaird, C. (2010), *Resourcing small and medium sized enterprises,* Heidelberg: Springer-Verlag.

Mac an Bhaird, C. and Lucey, B. (2010), Determinants of capital structure in Irish SMEs. *Small Business Economics*. 35 (3), 357-375.

Mac an Bhaird, C. and Lucey, B. (2011), An empirical investigation of the financial growth life cycle, *Journal of Small Business and Enterprise Development*, 18 (4), 715-731.

Mach, T. and Wolken, J. (2012), Examining the impact of credit access on small firm survivability, Finance and Economics discussion series, Divisions of Research and Statistics and Monetary Affairs, Federal Reserve Board, Washington D.C., 2012-10.

Mateev, M, Poutziouris, P., and Ivanov, K., (2013), On the determinants of SME capital structure in Central and Eastern Europe: A dynamic panel analysis, *Research in International Business and Finance,* 27, 28-51.

McCann, F. (2011), Access to credit amongst SMEs: Pre and post-crisis evidence from Eastern Europe, Central Bank of Ireland, Economic Letter Series, 2011, (3).

McCann, F. (2011), Access to credit amongst SMEs: Pre and post-crisis evidence from Eastern Europe, Central Bank of Ireland, *Economic Letter Series*, 2011, 3.

Organisation for Economic Cooperation and Development (2009), The impact of the global crisis on SME and entrepreneurship financing and policy responses, Centre for Entrepreneurship, SMEs, and Local Development, Paris.

Poutziouris, P. (2003) The Strategic Orientation of Owner-Managers of Small Ventures. *International Journal of Entrepreneurial Behaviour & Research,* 9**,** 185-214.

Poutziouris, P. Z. (2002) The Finanical Affairs of Smaller Family Companies. IN Flethcer, D. E. (Ed.) *Understanding the Small Family Business.* London, Routledge.

Ruis, A., Van Stel, A., Tsamis, A., Verhoeven, W. and Whittle, M. (2009), Cyclicality of SME finance, EIM Business and Policy Research, Brussels. http://ec.europa.eu/enterprise/newsroom/cf/_getdocument.cfm?doc_id=3127

Sánchez-Vidal, J. and Martín-Ugedo, J. F. (2012), Are the implications of the financial growth cycle confirmed for Spanish SMEs?, *Journal of Business Economics and Management,* 13 (4), 637-665.

Sogorb Mira, F. (2005) How SME Uniqueness Affects Capital Structure: Evidence From a 1994-1998 Spanish Data Panel. *Small Business Economics,* 2**5,** 447-457.

Stiglitz, J. E. and Weiss, A. (1981) Credit Rationing in Markets With Imperfect Information. *The American Economic Review,* 71**,** 393-410.

Storey, D. J. and Greene, F. J. (2010) *Small Business and Entrepreneurship,* Harlow, England, Pearson.

Udell, G, (2009), How will a credit crunch affect small business finance?, Federal Reserve Bank of San Francisco Economic Letter, 2009-09.

Ullah, F., North, D., Baldock, R. (2011), The impact of the financial crisis on the financing and growth of technology-based small firms in the United Kingdom, ISBE Rake fund, London.

Vos, E., Jia-Yuh Yeh, A., Carter, S. and Tagg, S. (2007), The happy story of small business financing. *Journal of Banking and Finance,* 31 (9), 2648-2672.

Whelan, K. (2009) "Policy Lessons from Ireland's Latest Depression". Working paper WP09/14, Centre for Economic Research, University College Dublin.