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**Information asymmetry and capital structure
in SMEs: new technology-based firms in the
Irish software sector**

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Information asymmetry and capital structure in SMEs: new technology-based firms in the Irish software sector

Abstract

This paper examines the capital structure of 117 new technology-based firms in the Irish software sector. In apparent contradiction to the pecking order hypothesis (POH), most external finance is private equity, and debt is virtually absent. We argue that this is consistent with the spirit of the POH – that firms prefer sources of finance associated with the least information asymmetry. For unlisted technology firms this is private equity. Using information on founders' perceptions gathered via survey, we confirm that software firm founders perceive greater information asymmetries in debt than in equity markets, and they agree that issuing equity sends a positive signal about the value of their firm. Founders also perceive low tax benefits of debt, and very high levels of business risk.

1. Introduction

The capital structure of listed firms has received considerable attention over the past few decades. Recent empirical work has been dominated by the debate over whether the pecking order hypothesis or static tradeoff theory can best explain the observed capital structure of listed firms (Helwege and Liang, 1996; Shyam-Sunder and Myers, 1999; Frank and Goyal, 2003). The pecking order hypothesis (POH) of Myers (1984) and Myers and Majluf (1984) posits that due to information asymmetries between firms and providers of finance, internal sources are preferred over external, debt is the preferred source of outside finance, and equity is issued only as a last resort. The static tradeoff hypothesis suggests that there is an 'optimal' capital structure for each firm, which trades off the tax benefits of debt against the increasing likelihood of financial distress as leverage rises. Extrapolating from the large body of empirical evidence on capital structure, it is clear that while each theory contributes useful insights to explain financing in large public firms, neither provides a complete explanation of observed capital structure across industries, countries, and firms of different size and age (Brealey and Myers, 2000). This conclusion has recently been confirmed by Graham and Harvey (2001) in a wide-ranging survey-based study of corporate finance.

Financing decisions in small and medium-sized enterprises (SMEs) have received comparatively little academic attention, despite their economic importance. We examine the capital structure in NTBFs using a unique survey-gathered data set of Irish software firms. It is now widely accepted that small firms – and in particular, new technology-based firms (NTBFs)¹ – make a disproportionate contribution to new job creation. In Ireland, the software sector has played a major role in the country's economic renaissance since the early 1990s. Ireland now ranks with the United States as the biggest producer of software products and services. The software sector accounts for 10 percent of GDP and more than 10 percent of exports, and it employs almost 2 percent of the workforce.

We find that on average there is a 50/50 split between internal and external finance for 117 sample firms. The vast majority of external finance comprises private equity, and

debt is virtually absent, even amongst the older firms. While appearing to contradict the POH, we argue that these findings are consistent with the spirit of Myers' (1984) and Myers and Majluf's (1984) theory, because the POH suggests that firms will prefer sources of finance associated with the lowest level of information asymmetry. For NTBFs, the outside source of finance associated with the least information asymmetry is venture capital. Venture capital finance is specifically designed to overcome many of the information asymmetry problems that small, private firms face in debt markets (Sahlman, 1990). In the second stage of our survey, we question the sample firm founders on their perceptions of information asymmetries in bank and venture capital markets, and on the signalling effects of debt and equity issues. The founders perceive considerable asymmetries in the bank-client relationship, and to a significantly lesser extent in venture capital markets. Consistent with the information asymmetry explanation behind the POH, we find a significantly stronger perception amongst founders that issuing equity sends a positive signal about the firm's future prospects relative to issuing debt. In order to tap venture capital markets, small business owners must relinquish considerable control of their businesses – something that SME owner-managers are well known to be extremely reluctant to do. We find that the sample firm founders are much more willing to relinquish control of their businesses than has been reported in prior studies of SME owner-managers.

There are three other potential explanations for the dearth of debt in the sample firms. One important potential explanation relates to the nature of the firm's assets. Firms with intangible assets tend to have relatively low debt ratios (Long and Malitz, 1985), and software firms are characterised by a near-absence of tangible assets (Oakey, 1984; Bank of England, 2001). The second relates to the tax benefits of debt. Particularly in their early years, NTBFs tend to be unable to take advantage of debt tax benefits because they have low or negative earnings, and significant non-debt tax shields such as research and development expense. We confirm that tax issues are not critical for NTBF founders in their financing decisions. Third, the static tradeoff theory also suggests that firms with a high likelihood of encountering financial distress have low debt levels. It is generally

assumed that NTBFs are very risky because their products are usually untried and subject to early obsolescence, and they often have a limited number of customers or clients. There is, however, very little hard evidence on this issue. We question founders on their perceptions of the likelihood of failure as a result of business as distinct from financial risks, and find that more than half of respondents believe that, even with adequate financing, their firm has a 50 percent chance of failing. A surprising finding is that founders of older businesses are just as pessimistic about survival as their younger counterparts. This runs contrary to evidence from studies of business failure rates, which show a strong positive relation between firm age and survival. Such pessimism may explain why leverage remains low amongst the older firms.

The remainder of our paper is structured as follows. In the next section we review the evidence on information asymmetries in SME and NTBF capital markets, and in section 3 the prior evidence on the debt tax shield and business risk is discussed. In section 4 we present the sample characteristics, including summary information on age, size, research intensity and sources of finance. Section 5 contains our findings on founders' perceptions of the issues relating to capital structure choice, and section 6 summarises and concludes.

2. Information asymmetries and the POH

At the heart of the POH is the asymmetry of information between the company's management and 'uninformed' outside investors. This information asymmetry implies that a new share issue will trigger a reduction in the stock price, because investors assume that managers will issue stock only if they perceive it to be overvalued. The POH predicts that, in order to avoid this adverse signalling problem, managers will finance projects from retained earnings where possible. Once internal sources of finance are exhausted, managers will opt for debt in preference to equity.

2.1 SMEs and the POH

Several studies have shown that the POH tends to hold for small privately held firms (Schulman, Cooper and Brophy, 1993; Cosh and Hughes, 1994; Berggren, Olofsson and Silver, 2000). The rationale for this pattern of financing, however, cannot be the same for SMEs as it is for large firms. The information asymmetries discussed in Myers (1984) and Myers and Majluf (1984) arise from the separation of ownership and control, and this is not a feature of most small businesses. The preference for internal sources of finance is explained by small firm debt markets suffering from information asymmetries that give rise to moral hazard and adverse selection (Stanworth and Gray, 1991). Since the repayments on debt financing are fixed, debtholders face an asymmetric payoff. They do not participate in the additional returns generated if the firm is successful, but they share in the losses if the firm fails. The owner-manager is the beneficiary if the firm is successful. In such cases, SME borrowers have an incentive to 'gamble with the bank's money' and pursue high-risk projects. Adverse selection arises if debt providers such as banks have difficulties in discriminating between 'good' and 'bad' investment projects, resulting in financing constraints for small business generally. Several studies have confirmed that adverse selection is a critical issue for SMEs (Binks and Ennew 1994; Cosh and Hughes, 1994; Chittenden, Hall and Hutchinson, 1996; Berger and Udell, 1998; Michaelas, Chittenden and Poutziouris, 1999).

The preference for debt over external equity is usually explained by owner-managers being unwilling to relinquish control. It is well established in the small business literature that SME owner-managers are reluctant to give up independence and control (Cosh and Hughes, 1994; Chittenden, Hall and Hutchinson, 1996; Cressy and Olofsson, 1997; Jordan, Lowe and Taylor, 1998; Poutziouris, Chittenden and Michaelas, 1998), and outside sources of finance give rise to contractual arrangements that impinge on the owner-manager's ability to act independently (Cooley and Edwards, 1983; Hommel and Schneider, 2003). Debt is preferred to equity because debtholders interfere less in the management of the firm, and also because of the high costs associated with issuing outside equity (Chittenden, Hall and Hutchinson, 1996; Berger and Udell, 1998).

2.2 High technology firms

Although there is little empirical evidence on the capital structure of listed high technology firms specifically, they do appear to prefer external equity to debt (Brealey and Myers, 2000). Indirect evidence for the preference for external equity is that the increasing presence of high technology firms listed on stock markets probably accounts for the failure of the POH to hold in large sample studies of public firms during the 1980s and 1990s (Frank and Goyal, 2003). Helwege and Liang (1996), for example, follow a group of firms that went public in 1983. They find, contrary to the POH, that the sample firms do not exhibit a trend toward bond financing over time. Their sample is dominated by high technology firms, and judging from the reported failure rates, high risk firms as well.²

The evidence from several countries suggests that, as for SMEs generally, internal funds are the preferred financing source for NTBFs (Tyebjee and Bruno, 1982; Roberts, 1990 and 1991; Lumme, Kauranen, and Autio, 1994; Moore, 1994; Bank of England, 1996; Giudici and Paleari, 2000; Lindholm-Dahlstrand and Cetindamar, 2000). There is some evidence, however, that NTBFs are less likely to issue debt than other small businesses. Hyytinen and Pajarinen (2002) find a negative relation between high technology and debt; the median leverage for ICT firms in Sweden was 36 percent compared to 47 percent for non-ICT small firms. From the US and the UK there is evidence that debt is not the preferred source of outside funding at start-up (Roberts, 1990 and 1991; Moore, 1994; Brewer and Genay, 1994) and on a continuing basis (Oakey, 1984, Roberts, 1990 and 1991) for NTBFs.

NTBFs face serious information asymmetries in debt markets, even relative to the general population of SMEs (Bank of England, 1996 and 2001; Berger and Udell, 1998; European Commission, 2003). High-technology investment projects are associated with greater 'technology uncertainty' than other SMEs; that is, banks do not understand high-technology businesses (Oakey, 1984; Deakins and Hussain, 1993; Bank of England, 1996; European Commission, 2001). For this reason, banks tend to avoid lending to NTBFs.

Venture capitalists are best equipped to overcome these information asymmetries and moral hazard problems (Amit, Brander and Zott, 1998; Gompers and Lerner, 2003). Their ongoing relationship with the firm allows venture capitalists to closely monitor and advise managers, and by ensuring that the owner-managers' interests are aligned with their own (Sahlman, 1990), reducing moral hazard. Information asymmetries are less likely because venture capital firms usually have in-depth knowledge of markets and technologies in specific fields (Ruhnka and Young, 1991; Gupta and Sapienza, 1991; Norton and Tenenbaum, 1993; Lindholm-Dahlstrand and Cetindamar, 2000). In order to accept venture capital, owner-managers must relinquish a substantial equity stake in return for venture capital support – typically 50 percent (Kaplan and Stromberg, 2003).

Three predictions for NTBFs arise from this discussion regarding information asymmetries and signalling. *First*, NTBFs perceive greater information asymmetries in debt markets than in venture capital markets. *Second*, the issue of equity sends a positive signal about the firm to other providers of finance, and to potential customers and clients. *Third*, in order to accept external equity, NTBF owner-managers must be willing to relinquish control of their firms. We address these issues by posing statements to sample firm founders on their perceptions of information asymmetries in debt and venture capital markets, and on signalling issues.

3. Other determinants of capital structure in NTBFs

3.1 The debt tax shield

The evidence relating to the value of the debt tax shield in large corporations is equivocal. Brealey and Myers (2000) summarise the literature as follows:

There is a moderate tax advantage to corporate borrowing, at least for companies that are reasonably sure that they can use the corporation tax shield. For companies that do not expect to be able to use the corporate tax shield we believe there is a moderate tax disadvantage (510).

The 'moderate tax disadvantage' applies to firms that are earning insufficient EBIT against which to claim the tax benefit. EBIT can be reduced by non-debt tax shields such as depreciation, amortisation and investment tax credits (DeAngelo and Masulis, 1980). Highly profitable firms with few non-debt tax shields will benefit from leverage, while companies with large accumulated losses or other valuable tax shields may not benefit at all. In addition, the value of the tax shield is directly related to the marginal corporate tax rate.

A number of researchers have suggested that the debt tax shield is relatively unimportant to SMEs. Small firms tend to be less profitable than larger firms (Day, Stoll and Whaley, 1985; Ang 1991 and 1992; Michaelas, Chittenden and Poutziouris, 1999). Vos and Furlong (1998) found that the tax advantage of debt was particularly irrelevant in the early stages of firm development. For NTBFs, EBIT is substantially reduced by research and development expense. Expenditure on research and development is the most widely used measure of technology intensity in international statistics. By definition, therefore, technology-based firms have higher levels of research and development expense, reducing taxable income, and thereby lowering the tax benefits of debt. We examine the debt tax shield issue by asking the founders to what extent they consider tax issues in the financing decision.

3.2 The probability of financial distress: business risk

The *static tradeoff hypothesis* suggests that there is an 'optimal' capital structure for each firm, which trades off the tax benefits of debt against the increasing likelihood of financial distress as leverage rises. The static tradeoff theory thus predicts that leverage is inversely related to business risk. High levels of business risk manifest as volatile EBIT, and such companies may find it difficult to support the large fixed interest costs that high levels of leverage involve. Empirical support for the inverse relation between optimal debt levels and business risk in large public firms can be found in Castanias (1983) and Bradley, Jarrell and Kim (1984).

There is a widely held perception that business risk is higher for NTBFs than for SMEs in general. The products of new technology-based firms are often untried, and are commonly subject to rapid obsolescence (Cooper, 1971). The limited empirical evidence on NTBF failure rates, however, is not consistent with this intuition. In a review of research on the determinants of small firm failure, Storey (1994) found that sectoral differences in failure rates are relatively modest, and Storey and Tether (1998) reported that European NTBFs actually have lower failure rates than start-ups in other sectors. This issue clearly requires further research. A second approach to gauging business risk in SMEs extrapolates from data on within-firm diversification. The less diversified the product and customer base, the greater the firm's exposure to variability in future income, and the riskier the firm. NTBFs tend to focus on developing a single product, which is often designed to meet the specific needs of one or a small number of customers (European Commission, 2000). We investigate business risk by questioning founders on their perceptions of the likelihood of their businesses failing even with adequate finance in place.

4. Data and sample characteristics

The software sector is sub-divided into 'products' and 'services'. Software products refer to packaged software that is generally produced in large volumes for mass markets,³ while software services include consulting, implementation, support services, operations management and training. We define software product firms as those that are primarily involved in the development and commercialisation of their own products. The population of software product firms was identified using a wide variety of information sources, including lists provided by the Irish Software Association and the National Informatics Directorate, lists of occupants of innovation parks, lists of participants in a national technology entrepreneurship award program, and firms cited in specialist journals. At the end of 2001 there were 257 indigenous software product SMEs in Ireland.

We based our survey design on self-administered questionnaires using the tailored design method (Dillman, 1976 and 2000). The survey was administered by mail and addressed to

named CEOs or Managing Directors. A covering letter requested that the surveys be completed by the founder, or by the lead founder if the company had been founded by a team. Respondents were given the choice of completing either a paper or web-based questionnaire. The first follow-up contact was also by mail, and the second by telephone. The final contact was via e-mail, and it contained a hyperlink to the electronic version of the questionnaire. Completed questionnaires were received during April and May 2002. The number of valid returns was 117, giving an impressive response rate of just under 46 percent.⁴

Table 1 summarises the data on company age. Panel A shows that the youngest firm is 5 months old and the oldest is 27 years. The average age is just under 6 years (5 years and 10 months), and the median age is 4¼ years. The table also reports the number of firms in 6 age categories (Panel B). As seen in column [3], 59 percent of firms were less than 5 years established in 2002, and 81 percent were less than 10 years old. Twenty-two firms (almost 18 percent) were over 10 years old, and of this group, 5 were more than 15 years old.

Table 2 summarises the data on firm size. We use two measures of size: employment and sales. Panel A shows employment numbers at start-up and at the time of the survey by firm size, using the European Union (ENSR, 1995) classification system for SME size by employment. In 2002, the sample firms employed a total of 3,005 people, giving an average 26 employees per firm. At start-up 80 percent of firms were in the 'micro' employment size class, with less than 10 employees. One-fifth of these had no employees. When comparing start-up employee numbers to those of 2002, it is clear that most companies have experienced growth. The number of firms with less than 10 employees fell from 80 percent to 37 percent of the sample, and of these only 4 percent had no employees. A small proportion grew substantially; 15 percent were classified as 'medium' – that is, greater than 50 employees – by 2002. This is consistent with Storey's (1994) hypothesis that only a small proportion of start-ups grow to become significant players. Turnover figures for 2001 are presented in Panel B of Table 2. Most respondent

firms are relatively small when size is measured by sales. Almost one-third turned over less than €127,000, and more than half had sales less than €635,000. Twenty-nine percent of firms had a turnover of greater than €1,270,000, and only 10 percent had a turnover of greater than €3,810,000.

Table 3 provides summary information on the sources of finance used to support current investment projects for the 96 firms in the sample that provided detailed funding information. These average figures for the full sample show a 50/50 divide between internal and external sources. In 2002 a mere 4 percent of financing was sourced from banks, and the remaining outside finance (46 percent of the total financing requirement) was private equity and government grants. Internal finance comprised savings of the founder, family and friends, and retained profits. A further critical source of internal funds for these firms was consulting revenues, which remained important even amongst the older firms. The importance of consulting revenues is evidence in support of the POH's prediction that firms prefer internal sources of finance, rather than incurring the various costs and personal disadvantages such as loss of control that goes with obtaining external sources of finance.

Consistent with the POH, internal sources dominate financing. The exception is for firms between 2 and 5 years old, for which the average internal finance proportion falls to 32 percent. These firms are at what is commonly known as the 'commercialisation' stage of development, and the reduction in internal sources is largely due to a running down of savings and a reduction of consulting revenues as the firm's human resources are mobilised into the commercialisation effort.

It is clear that the NTBFs in our sample were primarily self-financing at start-up; 73 percent of financing for the 12 firms aged less than 2 years was sourced internally. Most of this funding was from the personal savings of the founders (43 percent of the total), but a substantial component was provided by cash flows from consulting services (27 percent of total funding). External sources of finance were more important for firms in the range 2

to 10 years old, but were less in evidence for firms 10 years old or more. Retained earnings increased in importance for the older firms (10 years plus), for which it provided nearly half of financing requirements.

One particularly interesting finding is that the level of debt in the form of bank loans is very low, irrespective of firm age. We acknowledge that this sample suffers from survivorship bias, and this bias would be most severe amongst the older firms. However, these findings are largely consistent with prior research on capital structure in NTBFs. In the US, Roberts (1991) found that bank finance did not feature at all as a funding source for high-technology start-ups. The relative unimportance of bank loans amongst the older firms is consistent with the findings of Oakey (1984) that bank debt as a source of ongoing funding for NTBFs is negligible.

5. Findings from the survey questions

5.1 Information asymmetries

The founders' perceptions of bank-client lending conditions are consistent with the existence of high levels of information asymmetries. Table 4 reports founders' perceptions relating to bank and venture capital finance. Founders were asked to respond on a 5-point Likert scale from 0 ('strongly disagree') to 4 ('strongly agree'). The extent to which founders perceive that banks understand their business shows strong evidence of severe information asymmetries in the market for bank finance. Fifty-eight percent of founders do not agree that banks understand their business, whereas in only 9 percent of cases founders believe that banks understand them (row [1]), with the mean response for this statement being 1.28. This is consistent with findings from the Bank of England (1996), which found that few NTBF firms believed that banks understood their products or markets. If bank managers are unable to assess the technological basis for investment proposals, then information asymmetries will be severe and adverse selection will restrict the flow of debt funds to the technology sector. In contrast, only one-fifth of respondents do not believe that venture capitalists understand their businesses (row [4]), almost half

of the responding founders believe that venture capitalists understand their business, and the mean response is 2.27. We find that venture capitalists are perceived as better equipped to understand the software business than banks. A Wilcoxon rank sum test confirms that the responses to statement [4] are significantly more positive than those relating to statement [1] ($p = 0.00$).

The perceived lack of understanding on the part of bankers is reflected in founders' perception of the willingness of banks to lend to small private software firms. Row [2] in Table 4 shows that only 18 percent of founders believe that banks would be willing to provide long-term loans to their companies, whereas 53 percent disagree with the statement. This is low compared to the manufacturing sector in Ireland, where 41 percent of small firm founders believe they would not encounter difficulties in obtaining long-term bank loans (Chapman Flood Mazars, 2001). Our findings on the necessity of collateral (row [3] of Table 4) show that 77.5 percent of founders believe that banks lend money to companies with fixed assets and/or cash. As expected, the perception amongst responding founders on collateral (row [5]) is that the presence of fixed assets is not a prerequisite for venture capitalist involvement. Only a small minority of founders (18 percent) believe that venture capitalists invest in firms with fixed assets, while the remainder have no opinion (34 percent) or disagree with the statement (48 percent).

Information asymmetries in debt markets tend to diminish as firms forge a relationship with their bankers, precipitated by increased information flows (Binks and Ennew, 1996; Petersen and Rajan, 1994 and 1997). The responses by age to statements [1] and [2] relating to bank debt are presented in Table 5. In general, founders' perceptions of information asymmetries in debt markets diminish with age, although in the majority of cases the perceptions of asymmetries remain. None of the founders of firms less than one year old agree that banks understand their businesses, nor do any of them agree that banks are prepared to lend to them on a long-term basis. The proportion of founders agreeing that banks understand their business rises with firm age, to a still relatively low 20 percent amongst the oldest firms (older than 10 years). A similar pattern occurs for

the perceptions regarding the willingness of banks to advance long-term loans; the proportion of founders agreeing rises from 0 for the youngest firms to 35 percent amongst founders of firms greater than 10 years old.

5.2 Signalling

Table 6 shows that 70 percent of the responding founders believe that issuing equity (row [2]) sends a positive signal to external investors about the firm's future prospects. In contrast, only 21 percent believe that issuing debt (row [1]) sends a favourable signal, and a substantial 50 percent disagree that raising debt conveys a positive signal. The mean responses to these questions are 2.82 and 1.52 respectively, and the stronger response to equity issuance sending a positive signal is strongly significant ($p = 0.00$). This difference is also strongly apparent in Figure 1, which depicts the responses to the two statements for the complete Likert scale range.

This finding provides support for the prediction that NTBFs perceive greater asymmetries in bank relationships than in equity markets. While not directly comparable because the sample firms and the posed statements differ, our results on signalling are broadly consistent with Graham and Harvey (2001), whose 'small firm' and 'private firm' subsample respondents were significantly more likely to disagree with the statement "using debt gives investors a better impression of our firm's prospects than issuing common stock" than large firms and public firms. However, our findings on equity issuance sending a positive signal, are much stronger than Graham and Harvey's. Using the same 0 to 4 Likert scale, they report mean responses to the statement "issuing stock gives investors a better impression of our firm's prospects than issuing debt" of 1.33 for private firms as against 1.29 for public companies, and 1.52 for small firms versus 1.00 for large firms.

5.3 Control

Our survey addressed the issue of control by posing the statement “(prefer to) retain a majority stakeholding (50% or more) in the business for the founders”, and asking survey participants to respond on a 5-point scale with 0 being ‘not at all’ and 4 being ‘to a large extent.’ Thirty percent of respondent founders answered ‘not at all’ to this question, indicating that the maintenance of control of their firms was not important. Thirty-two percent responded ‘to a large extent’ – that is, maintaining control was very important to them. While there is little difference between the percentages of founders with strong opinions either way on this issue, the proportion willing to give up a majority shareholding is higher than found in prior studies of SMEs. Poutziouris, Chittenden and Michaelas (1998), for example, found that in the UK 49 percent of founders of small private companies would not even consider issuing external equity finance. Our findings for Irish software firms lend support to the finding of Berggren, Olofsson and Silver (2000) that NTBF owner-managers are less averse to ceding control than small business owners generally.

Is this finding stronger amongst firms that have external finance in place? Figure 2 depicts the response to the statement, separated into venture capital-backed and non-venture capital-backed firms. The figure shows a strong negative relation between the founders’ preference to maintain control and venture capital backing. The mean response to this question for the non-venture capital-backed firms is 3.4, and for the venture capital-backed firms it is 2.7. The venture capital backed firms are significantly more willing to relinquish control than the non-venture capital-backed firms ($p = 0.00$).

5.4 The debt tax shield

Our survey addressed the question of the importance of the debt tax shield by asking founders the extent to which they consider the difference in the tax treatment of retained earnings, interest and capital gains for shareholders when making financing decisions. We find that tax issues are clearly not a critical factor in the financing decision. Only 19

percent considered tax issues to be important in the financing decision, and for 35 percent the issue was not important at all. This may be explained by the high research and development expenses that software firms face. In almost two-thirds of the sample firms, more than a quarter of their employees are engaged in research and development. The expense involved in supporting such a strong commitment to research and development implies that the sample firms would have ample non-debt tax shields. An alternative (but not mutually exclusive) explanation may be found in two unusual features of the Irish tax system. For some time Ireland has operated a low corporate tax regime in order to encourage foreign direct investment. Exporting firms in the manufacturing and services sectors have attracted a 12 percent corporate tax rate since the 1970s, and in 1995 the government made a commitment to progressively extend this tax rate to all sectors by 2005. In addition, Ireland has a dividend imputation system, which eliminates the classical tax system's double taxation of dividends. Dividend imputation thus reduces the relative attractiveness of debt.

5.5 Business risk

The sample firm founders perceived a very high level of business risk. At the time of the survey (in April/May 2002), respondents were quite pessimistic about the probability of survival of their businesses. In responding to the statement "even with adequate finance, the company has a 50% chance of failing", fifty-two percent believed that, even with adequate financing, the company had a 50 percent chance of failing, while only 35 percent disagreed with the statement. This figure is well above the actual failure rates for SMEs that have been in business for on average 5 years (Ganguly, 1985). The measure attempts to capture the probability of failure resulting from the firm's inability to generate revenues from its trading activities, abstracting from financial risk. The perceived probability of failure tends to decline with age. Figure 3 delineates the responses to this statement by age, and shows the proportion at each age that responded both positively and negatively to the question "even with adequate finance, the company has a 50% chance of failing". The results for firms aged 1, 2, 3, 4 and 5 years are depicted

separately,⁵ and the remaining firms have been combined into 2 age range groups: 6 to 10 years and greater than 10 years.

Founders' perceptions of business failure are highest amongst 2-year-old firms, in which 70 percent of respondents agreed with the statement. This appears to decline for firms aged 3, 4 and 5 years. The founders of 5-year-old firms were the most optimistic about their prospects for survival: only 28 percent believed that the business had a 50 percent chance of failure, which is much lower than the 52 percent for the whole sample. A surprising finding is that founders of older businesses in the sample were rather pessimistic about survival. Forty-seven percent of the founders of firms that had been established for more than 10 years believed that their businesses had a 50 percent chance of failure even with adequate financing.

6. Summary and conclusions

In this paper we examine the capital structure of 117 private Irish software product firms. Financing is split 50/50 between internal and external sources, with external equity comprising an average 38 percent, and debt only 4 percent, of total requirements. By questioning founders via survey about their perceptions and opinions of information asymmetry and signalling in debt and private equity markets, we find evidence that the founders of software product firms perceive information asymmetries in debt markets, and to a much lesser extent in private equity markets. In apparent contradiction to the POH, founders overwhelmingly believe that issuing equity sends a positive signal to clients, suppliers and potential financiers, whereas most believe raising debt sends a negative signal. We argue that these findings are consistent with the spirit of Myers' (1984) and Myers and Majluf's (1984) theory of capital structure, because the POH suggests that firms will prefer sources of finance associated with the lowest level of information asymmetry. For NTBFs, this source is private equity provided by venture capital firms (or business angels). Venture capital finance is designed to overcome many of the information asymmetry problems that small businesses face in debt markets. To accept venture

capital finance, owner-managers must relinquish considerable control over their businesses. We find that the sample firm founders are much less concerned about maintaining control than has been found for SME owner-managers in prior studies, and that there is a strong negative relation between the preference to maintain control and venture capital use.

Our findings confirm that very few founders consider tax issues in their financing decisions. This may be because they have substantial debt tax shields in the form of research and development expenditure, and it could also reflect the fact that Ireland's low corporate tax rate and dividend imputation system diminishes the value of the debt tax shield. Finally, we find that the founders perceive very high levels of business risk as reflected in their perceptions of the probability of survival of their firms. This finding tallies with the widely held perception that high technology firms are very risky, but not with the rather counterintuitive (and somewhat scarce) evidence that NTBFs have lower risk than SMEs in general. However, it is possible that the widespread trepidation of founders reflects unusual conditions in the software sector at the time of the survey. In the second quarter of 2002, software firms were experiencing a revenue squeeze following the technology stock bust in 2000-2001, as client firms reigned in their computing budgets. The indigenous software sector experienced a reduction in revenue during the period 2002-2003 for the first time in its history, of 11 percent. This followed a period of sluggish growth of only 2 percent in 2001-2002, in a sector that had become accustomed to annual growth rates of more than 10 percent during the 1990s (National Informatics Directorate, 2004).

In conclusion, our work sheds light on a facet of NTBF decision-making that has received very little prior academic attention. NTBF owner-managers have a good understanding of the effect of information asymmetries in equity and debt markets, and this appears to inform their choice of financing. Our findings have important policy implications. Equity is clearly the preferred funding choice for founders in new technology-based industries. Ireland has well-developed venture capital and informal equity markets.⁶ In the absence

of effective and efficient markets for private and venture capital, NTBFs will face severe funding constraints. The European Commission (1999) concluded that, in comparison with the US, the lack of a well-developed risk capital market is the key obstacle to the development of innovative firms in Europe. Governments that support formal venture capital markets and informal investment markets will be facilitating increased participation in the development and commercialisation of knowledge-based, high-potential business ideas.

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Table 1
Age characteristics of the sample firms

Panel A: average age (months)			
Mean		70	
Median		51	
Minimum		5	
Maximum		324	

Panel B: number of firms by age			
	[1] Number of firms	[2] Proportion of sample (%)	[3] Proportion of sample cumulative (%)
< 1 year	2	1.7	1.7
1 – 2 years	13	11.1	12.8
2 - 3 years	29	24.8	37.6
3 - 5 years	25	21.4	59.0
5 - 10 years	26	22.2	81.2
> 10 years	22	18.8	100.0
Total	{ =SUM (ABO VE) }	{ =SUM(above) }	

Table 2 Size characteristics of the sample firms

Panel A: employment at start-up and in 2002					
Size class	Employees	Start-up		2002	
		Number	%	Number	%
Micro	0	24	21	5	4
	1 - 9	68	59	38	33
Small	10 - 49	22	19	55	48
Medium	50 - 99	1	1	11	10
	100 - 249	0	0	6	5
Total		{ =SUM(A BOVE) }	100	{ =SUM(ab ove) }	{ =SU M(ab ove) }

Panel B: turnover in 2001			
	Number	%	Cumulative %
Pre-revenue	22	19.3	19.3
< €127,000	13	11.4	30.7
€127,000 - €316,999	7	6.1	36.8
€317,000 - €634,999	22	19.3	56.1
€635,000 - €1,269,999	17	14.9	71.0
€1,270,000 - €3,809,999	22	19.3	90.3
€3,810,000 - €6,349,999	5	4.4	94.7
€6,350,000 - €12,699,999	2	1.8	96.6
€12,700,000 +	4	3.5	100.0
Total	{ =SUM(A	{ =SUM	

Notes. Turnover figures were requested in Irish punts, as euro notes and coins were not introduced until 2002, but report our findings in euro only. We requested sales information in the following bands: pre-revenue, < £100,000, £100,000 – £249,000, £250,000 - £499,999, £500,000 - £999,999, £1,000,000 - £ 2,999,000, £3,000,000 - £4,999,999, £5,000,000 - £9,999,999, and more than £10,000,000; these figures have been converted to euro. Five firms did not report the month of formation, so we assumed they were founded in the middle of the reported year and assigned them a monthly value of 6. Only 2 firms fell outside Little's (1977) age limit criterion for NTBFs, but these firms were included as they met Little's other criteria.

Table 3
Sources of finance in different age categories

Age Band (years)	Number of firms	Internal Sources of Financing %				External Sources of Financing %				
		Savings	Consulting revenues	Retained profits	Total internal	Bank loans	Venture capital	Private investors	Govt. grants	Total external
<2	12	43.0	27.0	2.5	72.5	0.0	13.0	10.0	4.5	27.5
2-4	46	10.0	13.5	8.5	32.0	3.0	38.0	18.5	8.5	68.0
5-9	20	9.5	28.0	18.0	55.5	6.5	28.0	3.0	7.0	44.5
10 +	18	10.0	20.0	46.0	76.0	5.0	11.0	5.0	3.0	24.0
Total	96	14.0	19.0	17.0	50.0	4.0	28.0	11.0	7.0	50.0

Notes. This table reports the averages for each source of finance, as a percentage of total financing, for the 96 firms that provided financing information.

Table 4
Founders' perceptions of bank and venture capital finance

	(a)	(b)	(c)	(d)
	Disagree (%)	Neither agree nor disagree (%)	Agree (%)	Mean response
[1] Banks understand my business (n = 117)	58.1	32.5	9.4	1.28
[2] Banks are willing to provide a long-term loan to my company (n=115)	53.0	28.7	18.3	1.44
[3] Banks lend money to companies with cash/fixed assets (n = 116)	4.5	18.0	77.5	2.98
[4] Venture capitalists understand my business (n=116)	19.9	31.0	49.1	2.27
[5] Venture capitalists invest in companies with cash/fixed assets (n=109)	47.7	33.9	18.4	1.69

Notes. This table reports on responses to three questions relating to founders' perceptions of bank and venture capital finance. Founders were asked to respond on a 5-point Likert scale from 0 ('strongly disagree') to 4 ('strongly agree'). Columns (a) and (c) aggregate responses 0 and 1 (disagree and strongly disagree) and 4 and 5 (agree and strongly agree) respectively. Comparing the responses to statements [1] and [4] relating to banks and venture capitalists understanding the business; the responses to statement [4] are significantly more positive than the responses to statement [1] at the 1 percent level of significance ($p = 0.00$). Comparing the responses to statements [3] and [5] relating to the issue of collateral (cash/fixed assets), respondents agree significantly more strongly with statement [3] than with statement [5] ($p = 0.00$). Both tests were conducted using a Wilcoxon rank sum test.

Table 5
Founders' perceptions of bank finance across age categories

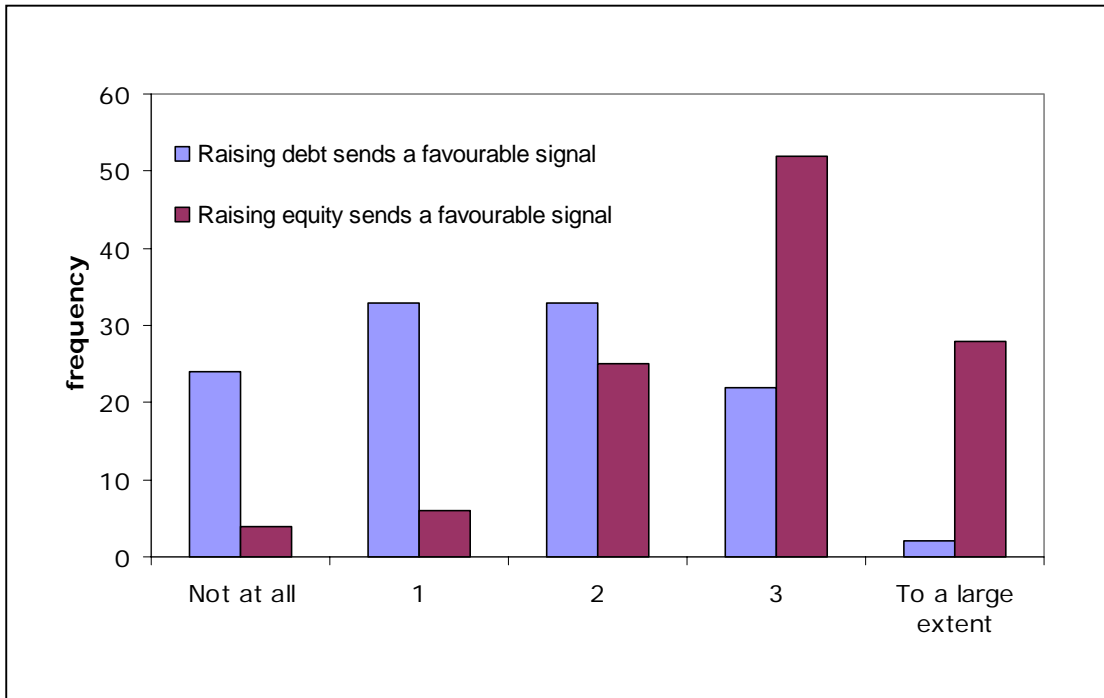
	Percentage of founders that agree			
	< 2 yrs	2-5 yrs	6-10 yrs	> 10 yrs
[1] Banks understand my business (n = 117)	0	7	10	20
[2] Banks are willing to provide a long-term loan to my company (n=115)	0	12	27	35

Table 6
Founders' perceptions on signalling

	(a)	(b)	(c)	(d)
	Not at all (%)	Neutral (%)	To a large extent (%)	Mean response
[1] Raising debt sends a favourable signal to lenders, investors, creditors and customers about the firm's future prospects (n = 114)	50.0	28.9	21.1	1.52
[2] Raising external equity sends a favourable signal to lenders, investors, creditors and customers about the firm's future prospects (n = 115)	8.7	21.7	69.6	2.82

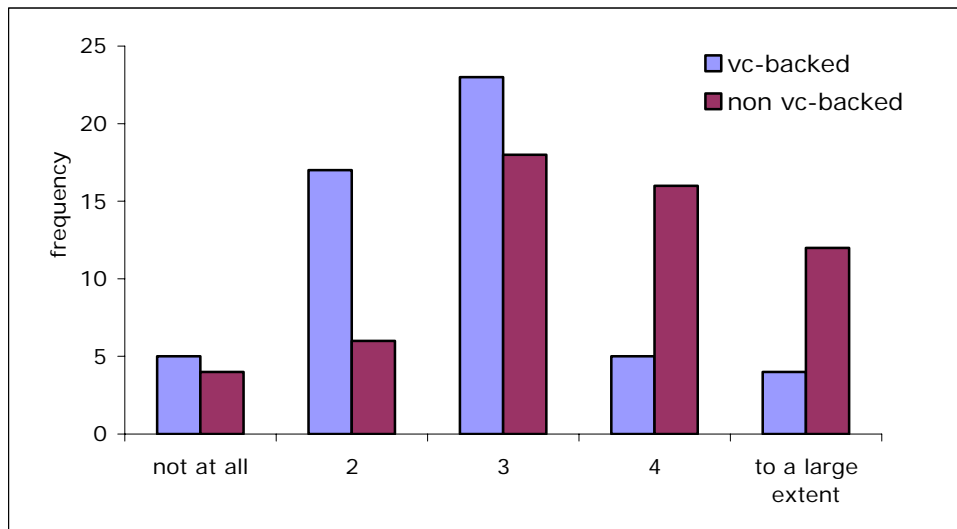
Notes. This table reports on responses to two statements relating to founders' perceptions of signalling when raising finance. Founders were asked to respond on a 5-point Likert scale from 0 ('not at all') to 4 ('to a large extent'). Columns (a) and (c) aggregate responses 0 and 1, and 4 and 5 respectively. The responses to question [2] are significantly more positive than the responses to question [1] at the 1 percent level of significance ($p = 0.00$), using a Wilcoxon rank sum test.

Figure 1 Founders' perceptions on signalling



Notes. This figure presents the findings on responses to two statements relating to founders' perceptions of signalling when raising finance: "raising debt sends a favourable signal to lenders, investors, creditors and customers about the firm's future prospects" and "raising external equity sends a favourable signal to lenders, investors, creditors and customers about the firm's future prospects".

Figure 2 Preference of founders to maintain control



Notes. This figure reports the response to the statement “(prefer to) retain a majority stakeholding (50% or more) in the business for the founders,” separated into venture capital-backed and non-venture capital-backed firms. Survey participants were asked to respond on a scale from 0 to 4, where 0 is ‘not at all’ and 4 is ‘to a large extent,’ implying that the higher the response number, the less willing is the respondent to relinquish control of the business.

Figure 3 Founders' perception of probability of failure in different age categories

{ EMBED Excel.Chart.8 \s }

Notes. This figure reports the response to the statement "even with adequate finance, the company has a 50 percent chance of failing" separated into age categories: firms less than 1 year old; 1-2, 2-3, 3-4 and 4-5 years, then 6-10 years old and more than 10.

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- ¹ NTBFs are defined by Little (1977) as independent ventures less than 25 years old that supply a product or service based on the exploitation of an invention or technological innovation.
- ² Helwege and Liang's (1996) sample of 367 firms comprises computer programming (18%), computers 45 (12%), telecoms and electronics 40 (11%); a total of 150/367 (41%) in information and communications technology (ICT). Other sectors that would be considered high technology are precision instruments (medical apparatus and supplies) (10%) and chemical and allied products (5%), giving a total of 56% of the sample in the high technology sector. By the end of 1993, 220 of their sample firms were no longer in existence (60%). The authors report that half of these were due to bankruptcy, giving a failure rate of 30 percent.
- ³ This can be distinguished from 'bespoke' software, which is provided on a client-by-client basis.
- ⁴ Response rates of 10 percent and less are commonly reported in small business mail surveys (Curran and Blackburn, 2001).
- ⁵ This is potentially the most interesting group as research indicates that younger firms have a much higher probability of failure. Ganguly (1985), for example, found that 55 to 60 percent of all businesses registering for VAT in the UK deregistered within 10 years, and 60 percent of deregistrations occurred in the first three years.
- ⁶ According to the Global Entrepreneurship Monitor (GEM), Ireland's venture capital investment is on par with the world average at 0.1 percent of GDP.