Research Issues: Financing New Technology Firms

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Introduction

Background
Over the last decade, there has been much talk about the “new global economy” and the “knowledge based economy”. The OECD (1998) notes that new technology-based firms (NTBFs) provide a disproportionate contribution to knowledge generation, technology diffusion, innovation, productivity gains and job and wealth creation. Moreover, NTBFs have reportedly grown faster than other start-ups and SMEs (OECD, 1998). It seems logical, therefore, to expect that such firms should be considered as having considerable potential to reward investors and lenders. Yet, it remains widely held that small and new technology firms are disadvantaged with respect to access to capital. Rob Dunlop (2001) captures this paradox when he states:

“Thirty years ago it was widely believed that large companies were inherently advantaged when it came to developing new technologies. Whether they were conglomerates or specialists in one product area, their advantages in financing, marketing and production over small firms seemed evident to most commentators. This was especially true in the area of finance, where an established firm can secure financing much more easily and on much better terms than a start up. And yet thirty years later our “new economy”, especially in the information technology sector, has seen major successes by firms that began as start-ups during this period – Microsoft, Mitel, RIM, Newbridge, Cognos, Cisco, JDS-Uniphase, PMC-Sierra, Hummingbird, Alis Technologies and many others. It would appear that there are business advantages in developing new technologies in a start-up that counterbalance the financing difficulties.”

Yet, access to financing is one of the challenges most frequently identified as a barrier to the development of NTBFs.

While debt financing is the most frequently-used source of capital among SMEs, alternative sources of financing include love money, informal investment, venture capital, and, for some, IPOs. Unfortunately, the markets for many of these sources of financing are new, fragmented, non-transparent or small in Canada and important information and knowledge gaps still may exist. For example, Table 1 describes “gaps” posited by the BDC (2001).
Table 1: Postulated Capital Market Gaps

<table>
<thead>
<tr>
<th>Perceived Gaps in the Debt Market</th>
<th>Perceived Gaps in the Venture Capital Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>A size gap is postulated such that business owners who seek small loans perceive that their borrowing needs are too small to be of interest to institutional lenders.</td>
<td>An early stage gap, which reflects the belief that small early-stage companies are not the strategic focus of most private investors.</td>
</tr>
<tr>
<td>A risk gap is claimed, according to which lenders do not price loans to reflect risk (rather, they reject loan applications if risk exceeds a particular threshold or if insufficient collateral is available).</td>
<td>A dollar gap, according to which Canada was said to rank tenth among developed countries in terms of venture capital funds raised per capita.</td>
</tr>
<tr>
<td>A flexibility gap is described in that some SME owners claim that financial institutions do not provide flexible terms and conditions on their loans.</td>
<td>An institutional gap that reflects the lack of involvement in the venture capital sector of pension funds, mutual funds, and other such institutions in Canada.</td>
</tr>
<tr>
<td>A knowledge gap is asserted, that “financial institutions do not understand knowledge-based businesses.”</td>
<td>A smaller appetite for IPOs in Canada compared with the US.</td>
</tr>
</tbody>
</table>


Defining Capital Market “Gaps”

Many of the research issues related to financing NTBFs (and SMEs in general) revolve around the concept of “gaps” in financial marketplaces. Therefore, it is perhaps useful to explore the definitions of the term “gap”.

Within the literature, the word “gap” has no generally accepted meaning. As used in the popular media (and, perhaps, by the BDC) the word “gap” connotes the idea of a shortage: a sense that the supply of the commodity in demand is insufficient and that the demand cannot be satisfied. Economic theory has straightforward meanings for the term shortage (gap) and its opposite, a surplus. A shortage (surplus) exists when the price for the product/service is too low (high). Taking the broad view, there is a “shortage” of everything good - there is just not enough to go around if everyone is to get the quantity each individual would like to have (e.g., at zero price).

In addition, it is an accepted industry practice for suppliers of capital to refuse to sell capital to some potential buyers. Hillier and Ibrahim (1993), for example, describe suppliers of capital as “the purchasers of risky promises to pay” who may chose not to purchase the “risky promise” if the entrepreneur cannot satisfy the supplier that the capital will be returned with a sufficient rate of return. In short, some firms will be, and should be, denied financing. Therefore observation that some firms cannot obtain capital is not prima facie evidence of a capital market gap.

Moreover, the type of financing needs to be suitable to that firm. For example, even rapidly growing firms may be turned down for a loan if equity financing is more appropriate or if their management is not up to the task of administering the growing enterprise. These events may be perceived as gaps but are often appropriate responses to the firms’ situations. For example, Peter Brierley Head of the Domestic Finance Division of the Bank of England (2001) states that,
“debt finance … is frequently not an available or appropriate source of funding for technology-based small firms at [early] stages of their life cycles … public sector intervention should be targeted at those areas where market imperfections can be identified”.

Two related perspectives suggest that: (a) enterprises that need capital are unable and/or not willing to pay the current market price or (b) businesses are precluded from paying the higher price by some imperfection. The first situation is not a capital shortage (gap) in any economic sense but rather a pricing dilemma. The second scenario reflects a capital shortage, as firms are not allowed to increase the price they pay for capital as much as they desire. A market gap or imperfection may be implied if firms that ought to receive financing are unable to obtain it. Such problems, when and if they exist, are real and significant, but using the terms “shortage” or “gap” can confuse the issue.

Economic theory usually views the idea of a gap as an “imperfection”, a factor that impedes supply and demand from clearing, resulting in markets that do not function efficiently. Imperfections may be conceptualized as a physical (or administrative) barriers such as geography, laws, transactions costs, or regulations. Market imperfections can also include the lack of a central meeting place at which suppliers of capital can encounter those seeking financing. Generally, the literature finds that such barriers can be overcome at a cost or that markets cease to function at all. For example, Chan (1983) shows that, in theory, the venture capital market may disintegrate if it is costly for venture capitalists to seek out deals.

More frequently, imperfections discussed in economic theory are those that relate to information asymmetry. Informational asymmetry is usually theorized to occur when suppliers of capital have less access to salient information than the owners of the firms that are seeking financing. When this occurs, economic theory contends that either adverse selection or moral hazard problems can ensue and that, under some conditions, the market may disintegrate.

Brierley’s position, stated above, reflects the views of many economists: that public policy should follow from findings of imperfections in the markets. However, the unequivocal identification of imperfections has posed a particular challenge for researchers. Accordingly, research is needed to gain a yet better understanding of these markets, of gaps or imperfections (if any), and the implications for all stakeholders. The research community therefore has a potentially important role in terms of providing independent and rigorous guidance with respect to both practice and public policy while addressing an interesting set of research questions.

**Objectives of this Paper**

Therefore, the objective of this paper is to build on the original scoping paper provided by Rob Dunlop (2001) to help prioritize research topics and approaches. The paper attempts to narrow the questions for research, operationalize them, prioritize them, and to suggest a practical set of research topics. The purpose of the resulting research would be to gain a better understanding of the fundamental factors and marketplace structures that affect the supply of financing to new technology firms.

To accomplish these goals, this paper draws on the framework used by Rob Dunlop and divides potential questions into five themes. The themes are specific, but not necessarily exclusive, to
NTBFs and underlying issues may well overlap. The themes, to be used as section headings in this paper are:

- Love money and informal investors ("angels");
- Canadian market for institutional venture capital;
- Valuation of new technology firms;
- Initial public offerings (IPO); and,
- Electronic access to financing.

Each of these themes is explored by building on the outline provided by Dunlop and then expanded through reference to the research literature to identify and prioritize research issues. First, however, the paper reviews the theories of capital rationing and information asymmetries that form the basis of economic perspectives on capital market gaps.

**Gaps in the Capital Markets: Differing Perspectives**

The basis of much of the recent academic research on capital market imperfections lies in the theories of information asymmetry and credit rationing. This section attempts to capture the essence what Berger and Udell (1992, p. 1048) say is “… an entire generation of work on credit rationing based on an information-theoretic approach … [about which] there remains little consensus”.

The awarding of the 2001 Nobel Prize in Economics to Spence, Stiglitz, and Akerlof was in recognition of their contributions to the development of these theories of information asymmetry. The models often assume that entrepreneurs possess salient private knowledge that is not shared with the lender or investor. Consequently, capital suppliers (lenders) cannot differentiate between a ‘high-quality’ firm and a ‘low-quality’ firm. Adverse selection can result and suppliers of capital need to invoke (costly) monitoring procedures (or contracts) that limit exposure to moral hazard. One consequence, in theory, can be that lenders respond by offering uniform terms of credit and by denying credit to particular classes of prospective borrowers, capital rationing. In general, however, theory is silent about the criteria on which suppliers of capital base capital rationing decisions.

In theory, information asymmetry can be mitigated in at least three ways, each of which reduces information asymmetry and provides salient information to investors or lenders:

- through a firm’s ability to somehow signal its worthiness;
- by having developed a strong relationship with its capital supplier; and,
- through due diligence or the supplier’s examination of the business plan and other lender requirements for documentation.

If these theories are correct, then firms that are most likely to receive capital are those that are able to reduce information asymmetry, perhaps by signaling the worthiness of the firm, by maintaining a relationship with the supplier, and through effective communications. Therefore, firms with the greatest difficulty accessing capital would be new firms that lack collateral and effective management.
Table 2: Degrees of Creditworthiness According to Theories of Information Asymmetry

<table>
<thead>
<tr>
<th></th>
<th>(&lt;) LESS INFORMATION ASYMMETRY</th>
<th>MORE INFORMATION ASYMMETRY</th>
<th>(&lt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Able to Signal Worthiness (e.g., through Collateral)</td>
<td>[ ] [ ] [ ]</td>
<td>[ ] [ ] [ ]</td>
<td>[ ] [ ] [ ]</td>
</tr>
<tr>
<td>Has an established relationship with lender</td>
<td>[ ] [ ] [ ]</td>
<td>[ ] [ ] [ ]</td>
<td>[ ] [ ] [ ]</td>
</tr>
<tr>
<td>Management of firm able to communicate worthiness</td>
<td>[ ] [ ] [ ]</td>
<td>[ ] [ ] [ ]</td>
<td>[ ] [ ] [ ]</td>
</tr>
</tbody>
</table>

It is not clear, from the practical or the academic literatures, whether or not credit rationing is practiced or the extent to which it is a problem. According to Berger and Udell (1992, p. 1048):

“[G]iven the reasoned arguments on all sides of this issue, it is clear that the significance or insignificance of credit rationing will have to be established empirically”.

However, empirical investigation of the extent or existence of credit rationing also lacks consensus. This presents an important research challenge. Are there, in the Canadian financial markets in which SMEs and NTBFs operate dimensions such as technology orientation that present barriers to financing? While economic theory is consistent with the idea that observationally distinct classes of borrowers may be rationed, theory does not specify the categories across which credit rationing might occur (if it exists!). If credit is rationed, it remains to identify the basis by which lenders discriminate among applicants and the dimensions across which they may deny loans, possibly leading to “gaps”. Is it possible that if credit rationing is present that it might be based on such dimensions as size, risk, or knowledge as suggested by the BDC? Hillier and Ibrahimo (1993, p 287) state that:

“[A]n implication of the [credit rationing] analysis is that when there are several observationally distinguishable classes of borrowers, some classes may be denied credit at any interest rate whilst other classes obtain credit”

Binks and Ennew (1996) argue that high growth firms may be more informationally opaque and may face a greater degree of difficulty obtaining financing. This is consistent with findings also reported by the CFIB (2001) to the effect that “young high performers” have the most difficulty accessing capital. Moreover, rapid growth can be a source of significant financial and managerial stress for a firm (Eggers, Leahy, Mikalachki, 1997). Rapid growth of sales, for example, usually leads to expansion of inventories and receivables, in turn generating a need for both additional cash and careful management. Creditworthiness requires that good fiscal management needs to accompany rapid growth.

However, Haines, Riding, and Swift (1993) used CFIB data to compare empirically loan turndown rates and terms of credit between technology-based firms and non-technology-based companies. They concluded that, after allowing for traditional determinants of credit policy (sector, size of firm, age of firm, etc.), loan turndown rates and other dimensions of bank credit
policy did not differ between the two categories of firms. From their analyses, they found that what appeared to be a gap based on technology orientation appeared to be more related to technology-based firms being small and young. However, it is not clear that this finding is robust across different definitions of “knowledge-based firm”. Further research is required.

Data currently being collected under the Financing Data Initiative (FDI) may potentially provide an opportunity to resolve such issues and to address empirically topics related to capital rationing with respect to both debt and equity. The FDI is a joint initiative of Industry Canada, the Department of Finance Canada, and Statistics Canada to document issues related to SME financing. Based on periodic large scale surveys of small firm’s experiences, as well as on other specialized studies, research-quality data may soon be available to undertake analysis of these topics.

**Love Money and Informal Investors**

Most reports on SME financing recognize that new and small firms, particularly new technology firms, are often unattractive to conventional lenders. Typically, they lack a financial track record and have few tangible assets on which to secure traditional debt financing. These firms often lack sufficient cash flows or assets to be eligible for debt financing and they may present additional risks related to technical, production and commercialization uncertainties. Finally, such firms are often seeking amounts of money to get started which make them uneconomic to formal venture capital firms for whom initial investments of less than $1 M are rare.

As a result, at the early stage of a business, love money (capital coming from family members or friends) and informal investment (capital provided by third party informal private investors) often represent the only sources of financing once entrepreneurs’ own savings have been committed. Table 3, extracted from GEM (2001), suggests that the informal market (defined by GEM as the combination of love money and private arm’s-length investments) is substantially greater than the formal venture capital market in most countries, including in Canada.

Business angels appear to be especially important to NTBFs -- not only as a source of capital but also as providers of management expertise, contacts, hands-on assistance, advice, and may also play an important certification role (Haines, Madill and Riding, 2002). Several research issues are immediately apparent.
Table 3: International Comparison of Risk Capital Investment Activity

<table>
<thead>
<tr>
<th></th>
<th>Institutional Venture Capital Invested in 1999 ($Millions, US)</th>
<th>Percentage of Population Making Investments in New Firms</th>
<th>Total Non-Institutional Capital Invested in New Firms ($Millions, US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>45,932</td>
<td>7.0</td>
<td>54,333</td>
</tr>
<tr>
<td>Germany</td>
<td>2,024</td>
<td>3.9</td>
<td>11,979</td>
</tr>
<tr>
<td>UK</td>
<td>1,895</td>
<td>3.1</td>
<td>12,610</td>
</tr>
<tr>
<td>Canada</td>
<td>1,489</td>
<td>2.7</td>
<td>3,373</td>
</tr>
<tr>
<td>Korea</td>
<td>890</td>
<td>5.5</td>
<td>16,939</td>
</tr>
<tr>
<td>Israel</td>
<td>432</td>
<td>3.7</td>
<td>651</td>
</tr>
<tr>
<td>Australia</td>
<td>288</td>
<td>2.6</td>
<td>2,803</td>
</tr>
<tr>
<td>Sweden</td>
<td>261</td>
<td>2.5</td>
<td>535</td>
</tr>
<tr>
<td>Singapore</td>
<td>145</td>
<td>1.3</td>
<td>458</td>
</tr>
<tr>
<td>Finland</td>
<td>106</td>
<td>3.6</td>
<td>269</td>
</tr>
<tr>
<td>Norway</td>
<td>96</td>
<td>5.1</td>
<td>656</td>
</tr>
<tr>
<td>Denmark</td>
<td>75</td>
<td>4.1</td>
<td>1,165</td>
</tr>
<tr>
<td>Argentina</td>
<td>n/a</td>
<td>2.5</td>
<td>1,383</td>
</tr>
</tbody>
</table>

*Source: GEM (2001).*

**Research Questions and Issues**

- The fragmented nature of the market suggests that those with capital and those in need of it may be unable to find one another: that no centralized marketplace is available. The operational efficiency of informal investment markets is therefore in question. Research is needed to determine the extent to which this physical imperfection impedes early-stage capital formation and to guide the design of remedial measures, if warranted.

- Asymmetry of information between angel investors and business owners may also present an imperfection in this market. Most of the theoretical literature on information asymmetry is set in the context of bank lending or equity issues in operationally efficient marketplaces. Both theoretical and empirical research are therefore needed to identify the role of information asymmetries in the market for early-stage risk capital.

- It is also argued that the overall supply of private investment may be limited, especially to NTBFs (see BDC, 2001, Table 1 above). Consequently, policy makers are pressured to develop means of increasing the availability of private investment. Suggestions include: revision of the tax treatment of equity investment and capital gains and losses; reform of securities regulations; and increased awareness and knowledge of informal investment by entrepreneurs (e.g., Chudleigh, 2002). Research is needed to identify whether, or if, such measures are warranted.
• Characteristics of informal investment in Canada, including market size, average deal size, regional distribution, growth rates, etc., remain to be ascertained. An impediment is the lack of a methodology for building a comprehensive database of informal investment activity or, in the absence of such a database, the development of a model to estimate the level of activity in Canada.

• Work is needed to evaluate further the impact that angel investment has on a firm’s financial performance, growth, ability to access later-stage financing, and its ability to commercialize innovative. Quantification is required with respect to the impacts of the availability of love money and informal investment on the birth and survival rates of new technology firms.

• Identification of factors (economic/social/structural) affecting informal investors’ activities? What factors prompt a person to become an informal investor? What factors determine investors’ valuations of technology companies?

To date, virtually all research has been based on convenience sampling and has been limited to developing profiles of investors and documentation of their investment patterns. While such studies have provide a consistent overview of the profiles, practices, and patterns of informal investors, as well as of their value added to the investee, further investigation on the supply side would still be useful.

**Canadian Marketplace for Institutional Venture Capital**

Significant structural differences exist between the U.S. and the Canadian venture capital markets. The growth of the venture capital market in the U.S. has been led by venture capital firms that are best described as private independent funds, often financed by financial institution investors. In Canada, the market has also grown substantively; however this growth has been dominated by labor-sponsored funds that obtain financing through public subscriptions supported by tax incentives. Other, possibly related, differences include: the respective level of competition (number of players, barriers to entry, ownership rules, etc.), other structural issues that include the tax system and regulatory regime (capital gains and loss treatment); the absence of a high-yield debt market in Canada; the low participation of institutional investors in the Canadian venture capital market; and the relatively narrow base of expertise and knowledge of Canadian venture capitalists.

Some adjustments have already been made to the tax system through the last federal Budget. Other changes will be implemented through the Canadian financial services sector reform to address the competition issues. However, further research and analysis are required to monitor the impacts of these changes on the access to capital by new technology firms and to investigate other structural issues related to the Canadian market for informal investors, venture capital and IPOs.
Overview of the Institutional Venture Capital Markets in Canada and the US

The Canadian Venture Capital Association recognizes five categories of venture capital firms (categories are based on firms’ respective sources of investment capital) that comprise the Canadian market:

- **private independent funds** which obtain capitalization from a small number of individuals or organizations;
- **labour-sponsored venture capital companies** (LSVCCs) which raise their capital by means of public solicitations to individuals and which are able to offer substantial tax incentives
- **corporate subsidiaries** which are funded by parent organizations,
- funds that derive their initial funding from *government-related* sources, and
- **other** funds.

The marketplace has been dominated by LSVCCs; however, private independent venture capital firms have recently become relatively more important. This has largely been the result of a recent proliferation of new private sector funds. According to Bloom (2001), the number of active venture capital firms in Canada increased from 67 in 1995 to 326 in 2000. The last few years have reflected an unprecedented level of activity in the Canadian venture capital sector. Bloom (2001) provides the following comparison between 1995 and 2000.

Table 4: Canadian Venture Capital Activity, 1995 vs 2000.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>1995</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Active VC firms</td>
<td>67</td>
<td>326</td>
</tr>
<tr>
<td>Capital under management</td>
<td>$6.0 billion</td>
<td>$18.8 billion</td>
</tr>
<tr>
<td>Number of companies financed during year</td>
<td>502</td>
<td>1,089</td>
</tr>
<tr>
<td>Number of Investments</td>
<td>610</td>
<td>2,566</td>
</tr>
<tr>
<td>Disbursements during year</td>
<td>$699 Million</td>
<td>$6.3 billion</td>
</tr>
</tbody>
</table>

*Source: Bloom (2001); Clendenning & Associates (2001).*

Table 5 presents a comparison of the US and Canadian venture capital industries.
Table 5: Venture Capital Activity in Canada and the US

<table>
<thead>
<tr>
<th>Measure</th>
<th>Canada</th>
<th>US</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (1999)</td>
<td>30.5 million</td>
<td>273.1 million</td>
<td>1:9</td>
</tr>
<tr>
<td>Number of Households (1999)</td>
<td>10.8 million</td>
<td>100.3 million</td>
<td>1:9</td>
</tr>
<tr>
<td>GDP ($ Cdn)</td>
<td>$1.0 Trillion</td>
<td>$14.9 Trillion</td>
<td>1:14</td>
</tr>
<tr>
<td>Number of VC Investments</td>
<td>2,566</td>
<td>5,380</td>
<td>1:2.1</td>
</tr>
<tr>
<td>Total Investment (2000)</td>
<td>$6.3 billion</td>
<td>$103 billion (US)</td>
<td>1:25</td>
</tr>
<tr>
<td>Proportion of VC to KBI</td>
<td>89%</td>
<td>97%</td>
<td></td>
</tr>
<tr>
<td>Average Size of Investment</td>
<td>$4.4 million</td>
<td>$16.4 million (US)</td>
<td>1:5.6</td>
</tr>
<tr>
<td>Pension Fund Commitments to VC Pools</td>
<td>$441 million</td>
<td>$55.5 billion (US)</td>
<td>1:189</td>
</tr>
</tbody>
</table>


These tables reveals several differences.

1. Canadian venture capitalists invested in a disproportionately large number of ventures (compared to the US). In part this reflects the finding that 45% of Canadian VC investments are to “early-stage” firms whereas only 23% of US VC investments go to early-stage companies. That is, US VCs make proportionately fewer, but substantively larger, investments. This poses a competitiveness issue because firms financed by US VCs may be better capitalized than Canadian NTBFs firms (see Bloom (2001) and Clendenning and Associates (2001)).

2. The average size of investments has been increasing in both countries, but at a much more rapid rate in the US than in Canada. These data reveal that the average size of Canadian VC investments has increased from approximately $1 million in 1995 to $4.4 million last year. In part, this is a consequence of increased activity among US investors in Canada. However, this trend may suggest that smaller firms at earlier stages of development may face even greater challenges.

3. The US industry relies largely on pension and other investment funds as sources of capital. In Canada, labour sponsored venture capital firms are among the largest venture investors but they derive their capital largely from individuals’ tax-incented investments. Relatively little capital is supplied to venture funds by Canadian institutions. However, several Canadian pension funds have recently been active as direct or syndicated partners in venture investments in Canada. This raises several potential research questions.

- Do the tax incentives associated with labour sponsored funds distort the Canadian market?
• What reasons lie behind the relative absence of institutional investors as providers of funding for venture capital pools? Is it possible that the tax incented labour sponsored funds have crowded out private independent firms?

• What are the rates of return on venture capital investment in Canada? Are they sufficiently high to warrant the involvement of institutions with fiduciary responsibilities for prudence?

Through the first half of 2001, the rate of VC investing in the US has declined considerably: from $54 billion invested during the first half of 2000 to $23 billion during the first half of 2001. Conversely, the rate of venture capital investment in Canada has continued near the 2000 pace, in no small part due to investments being made here by US venture capital firms (at least as of the first half of 2001). During the first half of 2001, Canadian venture capital firms invested approximately $2.5 billion in 521 financings; for the comparable period of 2000, the Canadian investment was $2.36 billion across 683 investments.

Are Gaps present in the Venture Capital Market?
The BDC asserted the presence of three “gaps” in the Canadian venture capital industry.

• an early stage gap, which reflects the belief that small early-stage companies are not the strategic focus of most private investors.

• a dollar gap, according to which Canada was said to rank tenth among developed countries in terms of venture capital funds raised per capita.

• an institutional gap that reflects the lack of involvement in the venture capital sector of pension funds, mutual funds, and other such institutions in Canada.

From the overview of the Canadian industry, it would appear that the second of these hypotheses is not tenable. The preceding tables all speak to a venture capital sector in Canada that is disproportionately large on a world scale. In some respects (e.g., the number of investments per capita) the industry is more active than that in the US. If comparisons are restricted to the US, it is true that the aggregated volume of venture capital investment is low and that this is at least partially attributable to the lack of participation from pension funds, mutual funds, etc. However, in comparison with other almost any other country in the world, Canada appears to be a leader in terms of venture capital activity and availability.

This discussion raises the question of how much venture capital is sufficient. Mason, Cooper, and Harrison (2001) investigated the development of the venture capital market in Ottawa. They note that the saturation of the US market is among the reasons that US venture capital firms are investing in Canada.

According to the US Small Business Administration (SBA), it is not entirely clear that a larger venture capital market is necessarily a benefit. According to the SBA (1998), the amount of capital under management by US venture capital funds has increased substantially during the 1990s, as has average venture capital fund size. Ordinarily, growth of the pool of venture capital would be viewed as good news for the SME sector. However, the SBA suggests that the organized venture capital industry may have become a victim of its own success. With the rapid
growth in the amount of available funds, the average value of individual investments has also experienced rapid growth. According to the SBA, large funds now prefer to invest not less than US$10m in any given venture capital partnership and prefer to represent less than 10% of that partnership capital. The 10/10 rule tends to drive venture capital funds to the US$100m+ range leading VC fund managers to make increasingly larger investments. The SBA report indicates that venture capitalists rarely fund deals of less than US$3m to US$4m.

This discussion begs the question of the extent to which the supply of venture capital in Canada is sufficient – or not – to meet the needs of those firms that require venture capital or whether there is a gap (in the shortage sense) of venture financing.

The theory of gaps in the venture capital market also derives from the work on information asymmetries. An agency problem occurs when the goals of the principal (e.g., bank, investor) and of the agent (owner(s) of entrepreneurial firm) differ and the principal lacks salient information possessed by the agent. However most theories of information asymmetry usually relate to the interface between the lender or investor and the owner(s) of the entrepreneurial firm seeking capital. In the case of institutional venture capital, the investor also acts as an agent -- on behalf of the original source of funding: pension funds, individuals, parent firms, etc. The responsibility to achieve the investment goals of the fund’s supply is superimposed on the VC’s decision process.

Agency problems are, in theory, particularly relevant for the institutional venture capital investor. First, the goals of the VC investor and the business owner arguably differ. The VC is primarily interested in growth of the investee firm and the firm is one of several in the VC portfolio. The business owner shares an interest in the growth of the firm, but also faces consumption needs. Second, the VC investor and the firm owner may hold different attitudes towards risk and may therefore respond differently towards the same situation.

The problems associated with informational asymmetry, however, are arguably mitigated in the context of equity investment relative to that of lending relationships. De Clerq and Sapienza (2000), for example, show that it is in the best interests of investor and entrepreneur to cooperate to achieve their mutual goals. Shepherd and Zacharakis (2000) and Manigart et al. (2001) contend that trust and confidence lead to cooperative behaviour for mutual benefit. Thus, recent academic research suggests that the entrepreneur-venture capitalist interface is much more cooperative in nature than that of the lender entrepreneur. This type of behaviour is more likely in a VC relationship than is a banking relationship for several reasons.

The VC (unlike the bank) stands to participate in future performance of the venture: the bank would only get the loan repaid with interest; the VC stands to share in appreciation of firm value. Second, the development of trust and confidence is engendered by a substantial due diligence process and a time-consuming process of negotiation and communication: this is not economic for small amounts of capital such as those normally encountered in bank loans. This is also why VCs prefer to invest relatively large sums. Third, it is argued that the size (in terms of the number of firms) of a VC portfolio tends to be much smaller than that typically managed by a bank loans account manager (see, for example, Wynant and Hatch, 1991) allowing the manager more time per investment. Thus, research is needed on further development of models of how venture capital investors and entrepreneurial teams interrelate.
Mason, Cooper, and Harrison (2001), in their investigation of the development of the venture capital market in Ottawa, addressed a ‘chicken and egg’ problem. Specifically, they asked which comes first: high technology firms or venture capital? Their study deals directly with (and in a Canadian context) two relevant issues to this work. The first is the geographic dispersion of venture capital. They also studied the extent to which technology firms (and other types of high growth companies) are constrained by limited access to local risk capital.

Mason and his colleagues conclude that four factors led to the development of an active VC market in the Ottawa region.

- the emergence of funds focused on specific technology spaces and weaker geographical ties’;
- the history of development in the Ottawa region has led to the “development of a supply of experienced managers willing to take jobs in start-up companies”; 
- the “spectacular” returns earned on some early investments caught the attention of the VC community; and,
- VC funds located in the Northeastern USA as well as funds located in Silicon Valley exceeded the opportunities available locally, “prompting a wider geographic search for investment opportunities”.

These findings are not consistent with the contention that the supply of institutional VC is limited for Canadian firms with strong growth prospects. Nor are these findings consistent with the hypothesis that the scope of venture capital investments is limited. According to Sohl (2001), US managers of VC funds are willing to travel – including travel to Canada – to explore investment opportunities.

Given these inconsistencies with the BDC assertion of gaps in the venture capital marketplace, it is instructive to review the literature on determinants of access to venture capital.

**Determinants of Venture Capital Decisions**

There is already a substantial literature on determinants of venture capitalists’ decisions. An important seminal article was that by Tyebjee and Bruno (1984) outlined the evaluation steps in the decision process. Subsequent work (Dixon, 1991; Fried and Hisrich, 1994; Hall and Hofer, 1993; Knight, 1990, 1994; Macmillan, Siegel, and Narasimha, 1985; Manigart, Wright, Robbie, Desbrieres, Philippe; and De Waele, 1997; Sandberg, Schweiger, and Hofer, 1988; Wright and Robbie, 1996; and Zacharakis and Meyer 1998), are examples, among many others, of ongoing work that attempts to identify the parameters of the venture capital decision process.

The literature examining the nature of the decision-making process used by venture capital firms can be classified in three categories.

1. The decision making process (e.g., Tyebjee and Bruno, 1984; MacMillan, Siegel, Narasimha, 1985; Fried and Hisrich, 1994).

3. Analysis of the valuation methods and techniques used by VCs, (Wright and Robbie, 1996; Manigart, Wright, Robbie, Desbrières and De Waele, 1997).

Specific Research Questions and Issues

- Do the tax incentives associated with labour sponsored funds distort the Canadian market?
- Research is required on the structure of the Canadian VC market relative to the market in other countries with particular emphasis on the implications of market structure for the future.
  - What reasons lie behind the relative absence of institutional investors as providers of funding for venture capital pools?
  - Is it possible that the tax incented labour sponsored funds are crowding out private independent firms and reducing marginal returns such that institutional investors lose interest?
  - What are the factors that drive U.S. pension fund managers to invest in venture capital that do not exist in Canada? If Canadian pension fund managers began to undertake venture capital investments to the same degree as in the U.S., what would the impact be on the availability of venture capital in Canada and what would the impact be on pension funds and on the economy as a whole?
  - Research is required to document the rates of return to venture capital investment in Canada? It remains to be determined if such returns are sufficiently high to encourage the involvement of institutions with fiduciary responsibilities for prudence?
- What characteristics or measures within the Canadian regulatory regime (e.g. private market and securities market regulations) contribute most/least to the emergence of new technology firms (modeling impact of specific measures or characteristics on behaviours)? What measures or characteristics of this regime could be changed to make the most incremental impact on investor and investee behaviour?
- What are the factors explaining the absence of a high-yield debt market in Canada? What would be the benefits/costs of establishing such a market in Canada?
- What are the differences in practices and expertise between U.S. and Canadian venture capital firms in terms of deal selection, firm monitoring, fundraising and exit strategies. How do these differences impact on the development of VC-backed companies in both countries? Given recent observations about the expansion of the geographic scope by VC firms, is the location of the VC fund still a determinant factor in investment decision-making? How can we explain this change?
To what extent does the syndication of venture capital deals have an impact on the valuation of firms, on the need for and availability of follow-on financing and on the terms of the deals (prior to IPO) in Canada - with comparisons to the situation in the US? Quantify the impact of this on the relative performance of firms that have received their investments from syndicated V.C. funds and non-syndicated deals in Canada versus in the U.S. Determine the impact on the growth, financial performance, innovative capacity of the firms and quantify the impact on the economy.

Valuation of New Technology Firms

Two related aspects of valuation pertain to the financing of new technology firms. The first is the most obvious: what is the overall value of early stage businesses often based on unproven technologies in sectors where barriers to entry may be low. The second aspect pertains to the relative values of the different stakeholders in the firm: inventors, managers, and suppliers of capital.

One of the perceived explanations of difficulties expressed by new technology firms in accessing financing is a lack of expertise and knowledge related to new technologies and the valuation of intangible assets and high-risk technology-based business ventures by financial service providers. Traditional criteria and valuation method may be inadequate for new technology firms. Also, as Åstebro, Johannsen, and MacKay (2000) note, “…intellectual assets of high technology firms are more difficult to value than the brick and mortar of low technology firms”. This “information opacity” may well make it relatively difficult (at least in theory) for knowledge-based firms to access capital.

Small, early stage new ventures face difficulties finding financing for several additional reasons:

1. the cost (broadly defined to include time, effort, and money) to complete a transaction can include a significant fixed portion which can be large in comparison to the funding requirements of a small early stage venture;
2. there can be significant unknowns in the transaction that are time consuming and expensive to resolve;
3. the value of the financiers’ contributions of managerial effort, contacts, etc. is difficult to value;
4. the various contributions of the entrepreneur are difficult to value.

A financier facing high transaction costs compared to deal size and payoffs that are difficult to value will find it difficult to arrive at a deal. The entrepreneur will find it similarly difficult, partly because he or she may not be in a position to properly value the various stakeholders’ (and potential stakeholders’) respective arrays of contributions, but also because of a desire to avoid losing payoffs that are rightly attributable to him or her.

Coincident with these difficulties, both parties face the classical financial deal making structure: the financier and entrepreneur make an agreement concerning the level of funding, and their individual participations in the deal, with little scope for re-negotiation should the initial
structure later prove to be unfair to one party or the other. The rigidity inherent in classical deal making does two things. It raises the stakes at the beginning of the process (which raises deal costs). It also elevates the importance of resolving information asymmetries between the financier and the entrepreneur, and filling in information gaps that the parties face jointly, both of which again raise deal costs. A solution from the financier's point of view is to require returns that are very high, which militates against deal completion.

Research is required to determine how to mitigate these difficulties. There is a need to measure as objectively as possible the deal pricing inherent in current risk capital deals and to benchmark them against a sensible standard. There is also a need to develop creative deal making structures that are more flexible than the classical model.

**Proposed Research Questions:**

1. To what extent does the professional background and knowledge of investors and venture capital fund managers have an impact on venture capital investments in new technology firms?

2. What models have been used successfully by venture capital firms to value new technology firms efficiently and effectively?

3. Does competition in the venture capital market have an impact on the valuation of new technology firms?

4. Does the size of the Canadian venture capital market and its degree of specialization impact the relative valuation of companies? Does this impact on the firms’ ultimate ability to grow - move out of “small” into “medium”? What are the impacts on the firms’ eventual value of initial public offering and post-public offering financings and performance?

**Initial Public Offerings**

**Canadian IPO Activity: 1990-2000**

The market for initial public offerings is highly cyclical. Between January 1, 1990 and December 31, 1999, approximately 179 Canadian firms undertook an IPO exclusively on the TSE (see Table 6 from Jog and Hitsman, 2000). Updating Jog and Hitsman’s figure to include 2000, approximately 210 firms have gone public on the TSE during the 1990-2000 period. Some periods can be identified as “hot markets”, including 1998-2000, in which there were both a high number of IPOs and a high demand for the newly-issued shares.

In addition, a substantive number of Canadian firms have issued IPOs in the US. Between January 1, 1994 and December 31, 2000, 46 Canadian companies made an IPO exclusively on NASDAQ or an IPO interlisted on NASDAQ and another exchange (usually the TSE). On the one hand, this might be interpreted as evidence of a lack of capacity for IPOs in Canada (e.g., BDC, 2001). It is therefore useful to gain a better understanding of this given the finding by
Shutt and Williams (2000) that going public in Canada is generally less expensive than doing so in the US.  

Foerster, Karolyi, and Mavrinac (1998) found that Canadian firms list on US exchanges for several reasons. CEOs recognized the greater access to capital, greater liquidity and higher degrees of institutional investment and analyst coverage associated with a US listing. The CEOs also recognized that American exchanges were more user-friendly, provided helpful marketing material and had more frequent contact with issuers. Foerster and his colleagues suggest that enhanced liquidity, credibility, and global image are the main reasons that Canadian firms list their shares on US markets. The importance of corporate image and credibility were found to be particularly important determinants of listing location.

Jog and Hitsman (2000) also speculate on reasons that may prompt Canadian firms to list in the US. They argue that with freer trade, many of the Canadian firm’s suppliers and customers may be located in the US and that they would be “more inclined to do business with firms having a presence in their own country”. If so, a Canadian firm could benefit from the visibility that attends having stock traded on a US stock exchange even if it keeps its operations in Canada. However, they also note that if this were the only reason for an IPO on a US exchange, then the domestic firm could simply create a foreign address or seek a cross-country listing after raising IPO capital in the domestic market. They conclude that differences in US and Canadian exchange rules (escrow requirements, and disclosure), taxation, and regulatory regimes may make the US a more attractive alternative for IPO listing.

Table 6: Canadian IPOs, 1990-1999

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of IPOs</th>
<th>Underpricing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>1990</td>
<td>1</td>
<td>-0.70%</td>
</tr>
<tr>
<td>1991</td>
<td>3</td>
<td>0.96%</td>
</tr>
<tr>
<td>1992</td>
<td>6</td>
<td>0.00%</td>
</tr>
<tr>
<td>1993</td>
<td>50</td>
<td>-11.36%</td>
</tr>
<tr>
<td>1994</td>
<td>19</td>
<td>-7.75%</td>
</tr>
<tr>
<td>1990-94</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>8</td>
<td>-4.00%</td>
</tr>
<tr>
<td>1996</td>
<td>26</td>
<td>-5.33%</td>
</tr>
<tr>
<td>1997</td>
<td>32</td>
<td>-11.11%</td>
</tr>
<tr>
<td>1998</td>
<td>17</td>
<td>-33.33%</td>
</tr>
<tr>
<td>1999</td>
<td>17</td>
<td>-33.33%</td>
</tr>
<tr>
<td>1995-99</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>1990-99</td>
<td>179</td>
<td></td>
</tr>
</tbody>
</table>

Source: Jog and Hitsman (2000).
These arguments raise the question of the degree to which the Canadian and US markets are integrated.

Several hundreds of academic papers that relate to IPOs have been published (See, for example, http://www.iporesources.org/iporesref.html). Generally, these papers deal with one of three aspects: valuation of the shares (e.g., Kim and Ritter, 1999), underpricing (e.g., Loughran, Ritter and Rydqvist (2000) summarized studies of IPO underpricing across 36 countries); and post-issuance IPO performance (e.g., Ritter, 1991; Jog, 1996).

Specific Research Questions and Issues
The most significant factors surrounding IPO and post-IPO financing revolve around the capacity of the Canadian markets to meet the needs of Canadian SMEs, in particular new technology firms. Questions related to the current structure of the Canadian IPO market that would greatly benefit from further research include:

- To what extent does volatility or a decrease in the IPO market activity impact venture capital investors’ behaviour (and that of informal investors), as well as on the birth and survival of new technology firms?
- What is the relative effectiveness of second-tier markets (e.g. NASDAQ, CDNX, CPCs) as means of providing access to public markets for early-stage firms?
  - In reviewing the experience of other countries and their use of secondary markets, determine what characteristics contribute to optimal conditions for the growth of new technology firms.
  - Analyse the Canadian experience to determine what characteristics, if any, are lacking in its secondary markets. What has the impact of the CDNX been on the availability of capital and on economic growth? Is it an effective vehicle for new technology firms to access the capital they need to grow or investors to find places to invest?
  - Does the structure inherent in the Capital Pool Corporations restrict its usefulness to new technology companies? If so, what are the key factors contributing to this?
- To what extent can Canadian companies use the secondary market to raise capital and what are the limiting factors (e.g. cost, liquidity)? What impact does this have on company growth and financial performance? (Quantify)
- What are the implications of stock exchange mergers and alliances for the availability of new technology firms’ access to domestic financial markets?

Electronic Access to Financing
The information technology promises continued changes to ways in which financial services will
be provided. Historically, for example, loan account managers at commercial banks were faced with 80 to 120 clients (Wynant and Hatch, 1991). Account managers’ ability to deal with so many clients, the imperative to limit defaults, and the low lending balances combined to create an often-difficult relationship. When account managers changed, it was essential to manage the transition carefully to avoid dissatisfaction. Lending decisions were based on the so-called five C’s: collateral, capacity, conditions, capital, and character. Now, many small-balance loans are advanced without the intervention of a local account manager on the basis of electronic submission of loans applications and credit scoring. It is also reported that some financial institutions have scaled down their branch networks and diversified their distribution networks by using telephone and Internet banking.

These changes have both positive and negative aspects. On the one hand, critics have denounced “cookie cutter” loans because of the absence of human judgment and the possibility that creative business ideas that do not fit the credit scoring norms will be abandoned. On the other hand, the use of technology may provide account managers with more time to deal with account that are non routine.

It is not clear, however, how credit scoring models have been developed. What factors are measured in the credit scoring models and how are they weighted to deal with the arguably special case of new technology firms? Is there a systemic bias that, unknowingly even to the lenders, works against NTBFs?

It seems self-evident that technological changes will continue to impact the distribution networks used by Canadian institutions, and are reshaping the way financial services are being delivered to Canadian SMEs. The definition of a “banking relationship” is itself being redefined. Technological change can help loan account managers be more effective and efficient; however, there is also the potential to remove the human face of the lender and the attendant loss of loan account managers’ advice and oversight. As well, the growing importance of electronic trading is changing the operation of the financial market significantly. These technologies have also brought along a form of standardization of processes; however, it remains unclear whether these changes will improve or reduce accessibility to financing from the perspective of new technology firms. Close monitoring of this development in the next few years will be key to assessing its impact on Canadian SMEs and on new technology firms.

**Research Questions:**

1. What, if any, have been the impacts of Internet-based financing on access to the capital market, particularly for new technology firms? There is a need to analyze the impact (if any) on access to capital, pricing, time taken to access it, impact on growth, financial performance of the firms.

2. What are the implications of credit scoring on access to financing for new technology firms? What are the factors affecting it?

3. What are the impacts - direct and indirect - of Internet-centred databases linking new technology firms with angel investors? (e.g. COIN and Capital Connection in Canada,
ACENET in the U.S., Businessangels.com in Europe, etc.).

4. What are the theoretical considerations that have to be taken into account in building a credit scoring model for a sector that is information-based as opposed to asset-based?

Research Priorities

Priorities lie in the eye of the beholder. Research priorities for policy makers are likely to differ from those of academics or practitioners. If the issue is the financing of new technology firms, perhaps the most central issue is whether or not the markets for debt and equity finance are subject to capital rationing based on technology orientation. What evidence exists on the equity side suggests that technology firms, often viewed as having growth potential, actually enjoy an advantage with respect to informal investment and venture capital.

On the debt side, however, it may be that technology firms do face greater difficulties. This possibility has been reinforced recently from Statistics Canada’s initial findings from top-line analysis of data from the Financing Data Initiative. However, it is not clear that in reaching the conclusion technology-based firms were disadvantaged that Statistics Canada adequately controlled for such confounding factors as size and age of firm. Therefore, it would seem that an immediate priority would be to undertake rigorous empirical analysis of the presence and extent of gaps in the debt (and equity) markets for technology-based enterprises. This would include assessment of credit scoring models and their efficacy. The good news is that data from the Financing Data Initiative may be available that will allow for such tests.

A related research priority is the need to investigate the link between human and financial capital. It has been suggested that loan decisions and decisions about both informal and venture equity investments depend heavily on the managerial abilities of the founders or principals of the new businesses. There is reason to believe that debt and equity markets may not have gaps, however defined, but that they function properly and decisions to reject financing propositions are generally well founded given the (lack of) fiscal or managerial abilities of the principals of the firms.

A fourth research priority reflects the need to estimate rates of return to venture capital investment. Brierley and others suggest that equity capital is more appropriate to new technology-based firms than debt. If this is true, then it is essential that venture capital investments be adequate in terms of frequency and ample in terms of size to allow Canadian enterprises to be sufficiently capitalized to compete effectively in international markets. This may require additional supplies of institutional venture capital and yet greater involvement of pension funds and mutual funds. To convince the trustees of these funds that venture capital investments satisfies (or not) their fiduciary responsibilities, a rigorous and independent assessment of returns (and risks) to venture capital investment is necessary. A related research priority, then, would be work on the deal structure of early stage venture capital (and informal investor) contracting.

On the topic of financing early-stage technology firms, numerous other research needs have been specified here. Many of these research needs are important. The few listed above, however, seem to be the best places to begin. This work is not straightforward. Empirical work requires
expensive and time-consuming data gathering and folklore and myths abound to erroneously influence theoretical endeavours.

**A Reading List**


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