

Small Business Debt Financing,  
Family Ownership and Management, and Discrimination:  
Evidence from Canadian SMEs

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# Small Business Debt Financing, Family Ownership and Management, and Discrimination: Evidence from Canadian SMEs

## Abstract

Using unique survey data collected by Industry Canada and a new powerful Monte Carlo-based statistical classification and regression tool, we examine the family business effect, the racial effect and the gender effect on Canadian small business debt financing in the agency framework. Debt financing-related issues examined in the study include the accessibility of Canadian small and medium enterprises (SMEs) to short-term debt financing, the use of debt in their capital structure, and the interest rate. Multiple contributions are made to the small business debt financing literature. This is the first study examining influences of these three factors on all aspects of small business debt financing, especially using Canadian data. Second, we follow Wu and Chua (2004b) to clarify the step-wise relationship among three dimensions in measuring accessibility of small businesses to short-term debt financing. Third, we observe both significant and insignificant family business effects on different aspects of small business debt financing, and therefore clarify the special applications of agency effects generated by family ownership and management in small businesses, which are not the same as those in large public US enterprises in the view of commercial lenders as shown by Anderson, Mansi and Reeb (2003). Fourth, conclusions made by the current study provide new and more significant evidence to support the racial discrimination on different aspects of small business debt financing shown in previous studies, and clarify the puzzle of gender discrimination described in the literature.

**Keywords:** Small business debt financing, family business, race, gender.

**JEL subject classifications:** G21, G30, G32, K22, L22.

# 1 Introduction

Small and medium enterprises (SMEs) represent a powerful engine of the growth of the global economy. By 2001, 97.7% of the approximately 2.2 million Canadian businesses were classified as SME's (no more than 500 employees). These SMEs employed more than 10 million individuals, and contributed 43% of private sector Gross Domestic Product (GDP) in 2000<sup>1</sup>.

Access to capital is an important factor determining how rapidly businesses grow over time. Typically, SMEs access to financing resources is limited when compared to larger firms that are able to access public debt markets (e.g., Petersen and Rajan, 1994, 1995; Berger and Udell, 1995, 1998, 2002). According to the data released by Groupe Secor and commissioned by Business Development Bank of Canada (BDC), the total value of debt financing grew by an average 7% per year from 1995 to 1999, while the GDP average annual growth was only 3.4% per year for the same period. However, roughly 70% of SMEs did not approach financial institutions for new debt financing in that period (Thompson, 1998). This indicates that some barriers may exist which prevent or discourage some SMEs from seeking debt financing.

Debt financing is a classic topic in traditional finance, and Harris and Raviv (1990, 1991) provide a comprehensive summary in that literature. Several dimensions of debt financing in SMEs, including the accessibility of short-term debt financing, use of debt in SME's capital structure, and prices charged to SME borrowers, have been examined by prior research (e.g., Peterson, 1981; Boot and Thakor, 1994; Duca and Rosenthal, 1994; Petersen and Rajan, 1994, 1995; Burger and Udell, 1995, 1998). However, since seminal work by Becker (1957) a growing body of evidence has shown that some groups of SMEs may encounter more difficulty in accessing institutional credit resources than others.

Both racial and gender discrimination have been the focus in the small business debt financing literature. For instance, Bates (1973, 1991), Cavalluzzo and Cavalluzzo (1998), and Cavalluzzo, Cavalluzzo and Wolken (2003) find evidence that strongly indicates racial discrimination in debt financing of small businesses, while a big body of the literature from the late 1970s (e.g., Schwartz, 1979; Hisrich and Brush, 1984; Riding and Swift, 1990; Haynes and Haynes, 1999; Coleman, 2000, 2002) suggests that female-owned SMEs are less likely to access institutional lending. Furthermore, the role of organizational issues in debt financing has recently attracted financial economists' at-

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<sup>1</sup>Data Source: Small Business Research and Policy. Published by Industry Canada in July 2002. The document can be found from the following link:

<http://strategis.ic.gc.ca/epic/internet/insbrprppe.nsf/vwGeneratedInterE/rd00668e.html>.

tention. For instance, family-owned-and-managed business has been recognized as an important factor determining debt financing in the agency framework (e.g., Pemberton, 1996; Mishra and McConaughy, 1999; Anderson, Mansi and Reeb, 2003). As well, the legal form of SMEs' organization, such as sole proprietorship, has been found to be critical in the gender effect on debt financing (e.g., Wu and Chua, 2004a).

This study examines how factors, such as SME owner's individual characteristics including race and gender, and family ownership and management, affect SMEs' debt financing measured by their accessibility to short-term debt, use of debt in their capital structure, and their financial expenses in debt financing. Unique survey data collected by Industry Canada in 2001 is used to conduct the current research, and a new powerful but simple statistical tool *Boosting* is adopted for classifications and regressions. We find significant family business effect on the accessibility of Canadian SMEs to short-term debt financing and on the use of debt in Canadian SMEs, but insignificant effect on the cost of debt financing charged to them. These results show special features of the agency effect generated by family ownership and management which is different from that in US large public firms as shown by Anderson, Mansi and Reeb (2003). Consistent with the literature on racial discrimination in small business debt financing, we find significant racial effects on both accessibility of Canadian SMEs to short-term debt financing and the use of debt in their capital structures, but little evidence for the racial effect on the financial expenses bore by them. We also show the significant gender effects on all three aspects of small business debt financing, which clarifies the puzzle on this issue in the literature.

Multiple contributions are made to the small business debt financing literature. This is the first study examining influences of these three factors on all aspects of small business debt financing, especially using Canadian data. Second, we follow Wu and Chua (2004b) to clarify the step-wise relationship among three dimensions in measuring accessibility of small businesses to short-term debt financing. Third, we observe both significant and insignificant family business effects on different aspects of small business debt financing, and therefore clarify the special applications of agency effects generated by family ownership and management in small businesses, which are not the same as those in large public US enterprises in the view of commercial lenders as shown by Anderson, Mansi and Reeb (2003). Lastly, conclusions made by the current study provide new and more significant evidence to support racial discrimination on different aspects of small business debt financing shown in previous studies, but also clarifies the puzzle of gender discrimination described in the literature.

This article is structured as follows: Section 2 introduces the theory and background supporting the current research, and proposes three hypotheses. Data, variables and methodologies are described in Section 3, followed by Section 4 which presents statistical results. Conclusions are made in Section 5.

## 2 Theoretical Background and Hypotheses

Two topics relating to this paper have been studied extensively. The first, debt financing has received considerable attention from financial economists (see Harris and Raviv, 1991). Agency theory has developed considerably in its application to the owner-lender relationship since seminal work by Smith and Warner (1979) and the follow-up by Stiglitz and Weiss (1981). Previous studies the capital structure literature have examined both moral hazard and adverse selection problems engendered by debt. Monitoring, screening and signalling, have been proposed by prior research to deal with informational asymmetry between lenders and borrowers. Furthermore, different issues including accessibility to debt financing and credit markets, the use of debt, and the price of debt financing have received consideration (Shleifer and Vishny, 1997).

Petersen and Rajan (1994, 1995) and Berger and Udell (1995) have identified four significant differences between the debt financing of SMEs and that of large public companies. First, whereas large public companies are able to access various resources for debt financing, SMEs tend to use short-term debt financing from commercial lenders, especially institutional lenders and, in essence, convert them to long-term debt financing through renewing these short terms lines of credit (Berger and Udell, 1995).

Second, the informational asymmetry problems in SMEs are more serious than those in large public companies, and therefore the three traditional solutions to asymmetric information problems are not as effective as in public firms. Thus, traditional finance literature dealing with credit in small businesses (e.g., Petersen and Rajan, 1994; Berger and Udell, 1995, 1998) distinguishes debt financing in small businesses from that in large public companies using long-term relationship between lenders and firm owners to deal with the agency problems caused by informational asymmetry. Berger and Udell (1995) provide a detailed review of the relationship lending literature. Signalling and monitoring are both considered important ways to deal with agency problems between commercial lenders and SME borrowers. One special feature of monitoring in SME debt financing is that bonding, such as guarantee provided by the entrepreneurs and collateral, is widely

used due to the high cost of monitoring (Harris and Raviv, 1991).

Third, in SMEs, governance structure and type of business have a significant influence on debt financing, especially the accessibility to debt financing due to the private information generated and the use of debt in SMEs' capital structure (Stiglitz and Weiss, 1981). In particular, the literature has begun focussing on the family owned and managed business (see Vos and Forlong, 1996; Anderson, Mansi and Reeb, 2003)<sup>2</sup>. Agency theory suggests that managerial monitoring and pressure to meet interest payments can lower agency costs generated by informational asymmetry between lenders and owners (Shleifer and Vishny, 1997), while it is not clear that debt indeed accomplishes this for family-owned-and-managed firms as firm owners may have different and complex motives, rather than simply wealth accumulation, size expansion of their businesses, and professionalization of the management (Anderson, Mansi and Reeb, 2003).

Davidsson (1989), Vos and Forlong (1996) and Mishra and McConaughy (1999) contend family businesses owners, especially founding family CEOs, tend to take a higher risk by adopting a highly levered capital structure because of their limited growth capabilities, desire to maintain control and a high degree of employee well-being, and the preservation of self-esteem. These complex motives are due to the tie between founding family CEOs' personal wealth, including human capital, and the firm (Mishra and McConaughy, 1999). Nevertheless, high leverage is not necessarily equivalent to a high probability of using short-term debt financing, and there is debate on this issue in the small business debt financing literature. Mishra and McConaughy (1999) point out that founding family businesses are actually less likely to use short-term debt due to the presence of more stringent covenants in these types of borrowing, uncertain refinancing rates, and the risk of not being able to roll the debt. This is, however, not perfectly consistent with Berger and Udell's (1995) argument that a large proportion of small businesses are able to access LOC's due to entrepreneurs' personal wealth tied to their firms, and this is a bonding issue as stated above. Regarding the cost of debt financing, family business tends to have a lower one (Anderson, Mansi and Reeb, 2003).

Therefore, we have Hypothesis 1:

*Hypothesis 1: Family-owned-and-managed SMEs have different features in various aspects of debt financing from other SMEs.*

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<sup>2</sup>There are numerous definitions, for example 34 according to the detailed review by Sharma, Chrisman and Chua (1996), of family business, and more have been presented after their great contribution (e.g., Chua, Chrisman and Sharma, 1999). For this study, we use the rather broad one defined by Dyer (1986) “[a business] in which decisions regarding its ownership or management are influenced by a relationship to a family (or families)” (page xiv).

Fourth, discrimination in debt financing of SMEs tends to be more serious than that of large public company (Cavalluzzo, Cavalluzzo and Wolken, 2003). Two major classes, the racial effect and gender effect, of potential discrimination have been proposed in the small business debt financing literature. Although a growing body of evidence has confirmed their existence, these two issues are still not well addressed in the literature. Becker (1957) brought the issue of discrimination to light, and Phelps' (1972) classic theory is considered the seminal literature on racism and sexism in financial economics. Based on these contributions made by both Becker and Phelps, financial economists began addressing racial and gender effects on SME debt financing from the 1970s. Bates (1973, 1991), Cavalluzzo and Cavalluzzo (1998), Cavalluzzo et al. (2003) show that SMEs owners from some demographic groups may find it more difficult to access debt financing from commercial lenders than whites. Issues including application for debt financing (LaCour-Little, 1999; Cavalluzzo, Cavalluzzo and Wolken, 2003), loan denials (e.g., Gabriel and Rosenthal, 1991; Munnell, Browne, McEneaney and Tootell, 1996) and prices charged by commercial lenders (e.g., Peterson, 1981; Black and Schweitzer, 1985; Duca and Rosenthal, 1994; Courchane and Nickerson, 1997) have been.

Whereas the racial effect on SME debt financing is widely accepted by financial researchers, the gender effect is still puzzling. As reported by Brush (1992), the number of female-owned businesses in the United States tripled in the last 15 years of the twentieth century, and as stated by Coleman (2002), these businesses generated annual sales of over \$3.6 trillion. Schwartz (1979) a forerunner in the early research on female-owned small businesses, and the debt financing issues of these businesses were not examined until Hisrich and Brush (1984) and Neider (1987), who found that female-owned enterprises usually experience difficulty in securing debt financing but did not propose any reason. From early 1990s, large sample data from national research agencies are used to examine the gender effect. For instance, Riding & Swift (1990) used data from the Canadian Federation of Independent Business (CFIB), while Haynes and Haynes (1999), Coleman (2000 and 2002) used data from the National Survey of Small Business Finances (NSSBF). Researchers have generally found no statistically significant gender effect in loan denials or terms of borrowing after controlling for differences in business characteristics and owner's attributes, despite the strong belief of female business owners that lenders treat them disrespectfully (Fabowale, Orser and Riding, 1995). However, many of them find a significant gender effect in the use of debt (Schwartz, 1979; Kalleberg & Leicht, 1991; Fabowale, Orser & Riding, 1995; Coleman, 2000), although it is not unanimous.

To our knowledge, all existing studies on racial effect on SME debt financing and most studies dealing with gender effect are conducted using US data. Canada is a multi-culture country with SME owners from different demographic groups, and according to the report provided by NFWBO, women entrepreneurs comprised 36 percent of SME owners in Canada in 1998. Moreover, the number of women firm owners grew more quickly than the number of male firm owner did (BDC, 1999), and therefore, female-owned businesses play an increasingly important role in the Canadian economy. Studies on gender effect on Canadian SME debt financing include Riding and Swift (1990), Wynant & Hatch (1991), and Wu and Chua (2004a). The first two studies examine the gender effect on terms of borrowing, while the last one extensively studies gender effect on the debt use of Canadian SMEs. This last study finds a strong second-order gender effect by considering its interaction with the legal form of organization.

As argued by Feldman (1997) and Frame, Srinivasan and Woosley (2001), commercial lenders have been using credit scoring for decades now and therefore discrimination should be precluded when data on gender is not collected. Thus, it is possible that the gender effect is incorporated into other factors. Recently, evidence shows that there is a tendency for female owned small businesses to be sole proprietorships due to the lack of business education (Coleman, 2000, 2002), and that unincorporated businesses, both male and female, have diminished access to debt financing. If female owned businesses have a greater tendency to be unincorporated, then the lower leverage in female owned firms may be due to the legal form of organization used by female owned small businesses. As argued by Wu and Chua (2004a), thus, this tendency helps institutional lenders tell the “pure” gender of borrowers as it is very difficult to tell the gender of real borrowers explicitly if the legal status of organization is other than a sole proprietorship. This point is also supported by Rosa and Hamilton (1994).

In other words, we purport that neither the racial effect nor the gender effect has been well addressed in the literature on small business debt finance mainly due to two reasons. First, these effects are likely to be incorporated with other characteristics of SMEs and SME owners. Cavalluzzo et al. (2003) state that the racial effect may be highly correlated with firm characteristics and risk control, but they did not treat the interactions. They found that, consistent with Becker’s (1957) theory, competition helps reduce the racial discrimination in small business debt financing. Wu and Chua (2004a) have confirmed the second-order gender effect on Canadian small business financing by incorporating it with the legal status of organization. However, financial economists have realized that it is very difficult to completely separate these two effects from other interactive

factors. Second, Cavalluzzo et al. (2003) is one of the few studies addressing all three issues about debt financing stated above, while most of the studies only focus on one or two of the accessibility, capital structure, and cost of debt financing. Moreover, as argued by Wu and Chua (2004b), the accessibility to short-term financing has three step-wise dimensions: the application to institutional lenders from SME owners, the approval by commercial lenders, and SME owners' level of satisfaction with the term of the approved debt. They are not separate issues due to the self-rationing of SME borrowers. For example, if they think their applications will be turned down by commercial lenders, they will not apply, and therefore the approval rate may be high but subject to a sample selection bias. Both Petersen and Rajan (1994) and Cavalluzzo et al. (2003) have treated this statistical problem between application and approval in different ways<sup>3</sup>, but the level of satisfaction in examining the gender effect on SME debt financing has only been coped with by Wu and Chua (2004a).

Therefore, we propose the following two hypotheses:

*Hypothesis 2: Racial discrimination exists in different aspects of small business debt financing.*

*Hypothesis 3: Gender discrimination exists in different aspects of small business debt financing.*

### **3 Data, Variables and Hypotheses**

#### **3.1 Data**

Data used for the current study is entitled "Financial Needs of Canadian SMEs", and it was commissioned by Industry Canada in 2001 for providing better knowledge of SME owner's perceptions of various financing vehicles available. The population was Canadian SMEs with less than 500 employees, and the survey was a nationally representative sample of small business and an overview of the period of 1998-2000, with a focus on the first six months in 2001 and financing intentions for the upcoming year. A total of 10,020 questionnaires and telephone interviews were mailed to eligible Canadian firms or conducted, and 2,148 validly completed responses were received. After dropping 32 observations due to various reasons<sup>4</sup>, we were left with 2,116 observations.

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<sup>3</sup>Petersen and Rajan (1994) use a subsample of supply-constrained observations to solve the problem, while Cavalluzzo, Cavalluzzo and Wolken (2003) adopt a joint model for this following Van de Ven and Van Pragg (1981) and Bloom, Preiss and Trussell (1983).

<sup>4</sup>Thirty two firms were dropped from the sample as they did not meet the minimum eligibility requirements; the firm could not be a franchise, holding company, not for profit agency, have more than 500 employees or have at least one employee and sales exceeding \$30,000.

The survey covered different types of short-term debt financing, long-term debt financing, government programs or services, and equity financing. We concentrate on existing bank LOCs following the mainstream literature (e.g., Berger and Udell, 1995; Cavalluzzo, Cavalluzzo and Wolken, 2003). They argue that LOCs are ideal for studying lender-owner relationships as banks specialize in lending to highly information-problematic classes of borrowers.

The survey also collected data on typical financial variables, the owner attributes and organizational characteristics. Therefore, we consider it as a valid sample for conducting this study. However, missing data problem is one of the major limitations of the dataset, and therefore Wu and Chua (2004a, 2004b) adopt advanced econometrics methods to deal with it. Further, given the two different survey types used due to the low response rate from the mailing survey and their significant differences in reporting of financial information, some analysis of financial factors was not possible. Another serious validity problem with using the data set is that the identities of the firms in the sample are not available to us, and therefore we are not able to verify independently the self-reported data on financial data such as firm performance, size measured by total assets, and so on.

Nevertheless, the dataset was sufficient to examine the family business effect, the racial effect, and the gender effect on Canadian small business debt financing by addressing accessibility, capital structure and the cost. Furthermore, given the dearth of Canadian datasets, this particular set of information provides both a unique and first step to examining the Canadian situation.

## **3.2 Variables**

### **3.2.1 Dependent Variables**

The dependent variables used in the current study include three measures of SME debt financing, accessibility to LOCs, the use of debt measured by debt ratio, and the cost of debt financing measured by financial expenses. As stated above, these three issues are consistent with the mainstream literature on SME debt financing. For instance, Petersen and Rajan (1994) address the accessibility to short-term debt financing, Harris and Raviv (1991) and Coleman (2002) address the issue of debt use, and Berger and Udell (1995, 1998) and Cavalluzzo et al. (2003) address the price charged by commercial lenders.

Peterson and Rajan (1994) and Cavalluzzo et al. (2003), assert that neither the application for LOCs by SME owners nor the loan denials or approvals by commercial lenders is a good measure

of accessibility because one cannot tell whether the borrowers are self-rationing or whether the terms of borrowing are demand or supply constrained. Therefore, we follow Wu and Chua (2004b) and use all three variables, the application for LOCs by SME owners during the period 1998-2000 (APPLICATION), the approval by commercial lenders (APPROVAL), and SME borrowers' level of satisfaction with the terms of borrowing (SATISFACTION), to measure accessibility. As indicated by Wu and Chua (2004b), furthermore, these three variables are step-wise so that ignoring the relationship among them may cause a serious bias to the results.

All three variables are dummies with a value of zero or one, but the one measuring the borrower's satisfaction is complex. In the survey, information indicating whether the terms of LOC approved by lenders were satisfactory to the borrower are dealt with by asking three questions: "Was the borrower satisfied with: (1) the amount granted by the institution relative to the amount requested, (2) the interest rate, and (3) the service fees charged." A five point Likert Scale<sup>5</sup> was used to measure the borrower's satisfaction with each of these items. A dummy variable measuring the borrower's satisfaction was assigned a value of 1 if a firm owner recorded a score of 5 to all three questions, and zero otherwise<sup>6</sup>. In other words, a value of 1 for the variable means that a borrower is totally satisfied, and the level of satisfaction is a definition of accessibility from the point of view of the borrower.

The use of debt is measured by the debt-to-asset ratio in 2000 (DEBTRATIO), and the firm leverage is treated as a continuous variable. This approach is consistent Petersen and Rajan (1994), Berger and Udell (1995), and Cavalluzzo et. al. (2003). The debt-to-asset ratio is derived by total liabilities divided by total assets. We believe this is more suitable for small businesses, while current assets and/or current liabilities are excluded by some other studies for large public companies (see Harris and Raviv, 1990). Since the issue of satisfaction, which is also the issue of supply-binding or demand-binding leverages considered by Petersen and Rajan (1994) and Wu and Chua (2004a), has been considered in examining the accessibility of SMEs to short-term debt financing, it is not repeated here for analytical simplicity.

The cost of debt financing is measure by the average interest rate paid by SME borrowers to commercial lenders in 2000 (COST2000), and it is the ratio between the dollar value of financial expenses to the total liabilities in that year. The same as the debt-to-asset ratio, it is also treated

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<sup>5</sup> A score of 1 indicates the least satisfaction, while a score of 5 indicates the best.

<sup>6</sup> To guarantee the robustness of the analysis, we also assign a value of 1 to the dummy variable measuring the borrower's satisfaction if a firm owner has answered scores of 4 or 5 to all three questions, and zero otherwise. Statistical results are not changed qualitatively.

as a continuous variable.

### 3.2.2 Independent Variables

The current study is to examine the influence of family business, firm owner's race and gender on small business debt financing including accessibility, debt use and cost. Therefore, we treat these three factors as independent variables.

Family business is defined by ownership and management, and the variable (FAMILY) measuring it is a dummy variable with a value of 1 for family-owned-and-managed firms, and zero otherwise. Family ownership is defined by a majority ownership (more than 50 percent) held by a family or a family group, while they are family-owned-and-managed if owners are also managers for daily operation of the firms. This is consistent with the family business defined by Dyer (1986), a widely accepted definition, but no information about the succession issue claimed by Chua, Chrisman and Sharma (1999) was covered by the survey.

The independent variable measuring racial groups adopted by the current study is consistent with the variable used in the mainstream literature (e.g., Cavalluzzo, Cavalluzzo and Wolken, 2003), and it is measured by visible minority (MINORITY) with a value of 1 for visible minor groups and zero for the rest. The independent variable measuring gender (GENDER) is assigned a value of 1 if a firm owner is male and zero for female firm owners.

### 3.2.3 Control Variables

**Agency Variables** As discussed in Section 2, relationship, bonding and signalling have been widely accepted by financial economists as the main tools to effectively deal with agency problems generated by informational asymmetry between lenders and SME firm owners.

The effect of relationship is considered one of the significant differences between debt financing of SMEs and that of large public companies (Petersen and Rajan, 1994; Berger and Udell, 1995; Wu and Chua, 2004a, 2004b). Following Hedges, Wu and Chua (2004), the strength of lender-borrower relationship is measured by three dimensions: (i) whether the bank supported the firm when times were difficult (RELATION1), (ii) whether the bank was willing to negotiate credit terms (RELATION2), and (iii) account manager turnover (RELATION3). These three dimensions are indexed by five-point Likert scales, with a score of 5 indicating high satisfaction while a score of 1 indicating low satisfaction.

Bonding and monitoring is measured by two variables, the guarantee required by the institution (GUARANTEE) and the board meeting frequency in 2000 (BMF2000), although four ways (collateral, accounts receivable and/or inventory, guarantee and compensating balances) have been proposed in the literature (e.g., Petersen and Rajan, 1994; Berger and Udell, 1995; Coleman, 2000, 2002) to secure loans. As indicated by Berger and Udell (1995, 1998), guarantee and collateral are two of the most popular ways for monitoring, and they are mutually exchangeable. Following the corporate governance literature on board activities (e.g., Jensen, 1993; Vafeas, 1999), board meeting frequency is an effective way of monitoring in the lender-borrower relationship but is interrelated with the lagged firm performance (Vafeas, 1999, Wu and Chua, 2004b). Therefore, using BMF2000 as one of the monitoring variables may cause some multi-collinearity problems in the statistical analysis, and this issue will be discussed later in the sub-section for methodology. Both variables are dummies. The variable GUARANTEE has a value of 1 for firms providing guarantee as required by the institution and zero otherwise, while the variable BMF2000 is assigned a value of 1 if firm has more than two board meetings in 2000, and zero otherwise.

Following studies using the same dataset (Hedges, Wu and Chua, 2004; Wu and Chua, 2004a, 2004b), we use three variables to measure signalling by the borrower. The first variable (PERSONAL) was measured by whether or not the owner used a personal line of credit to help finance the business from 1998 to 2000. The willingness of the owner to put personal wealth at risk alongside human capital is a strong signal of the owner's commitment to and confidence in the business. The second variable (REPORTING) is a dummy variable indicating whether or not a person other than the owner is in charge of finance and/or accounting matters. This individual, although employed by the enterprise presumably is a reasonable "third party" to ensure that the information about the enterprise is relayed to the lender in a timely and accurate manner. This provides the lender with some assurances that the information they are depending upon in their credit analysis processes is less biased than when the owner prepares the information, and it is consistent with traditional corporate finance papers suggesting that having a person in charge of financial and accounting matters signals the importance the firm attaches to such matters. The third signalling variable is FOUNDER, which indicates whether the borrower participated in creating the business. Such a borrower may be more committed to the survival of the firm.

**Firm Characteristics** Firm related control variables include: age of firm (AGEFIRM), home-based activities (HOMEBASED), number of employees (EMPLOYEES), the legal form of organi-

zation (SOLE PROPRIETORSHIP, PARTNERSHIP, PRIVATE, PUBLIC, and CO-OP), location of the firm (METROPOLITAN), stage of the firm's development (STARTUP, GROWING, MATURE, WINDING DOWN), and industry dummies. The age of the firm tend to be positively related to the leverage debt ratio because older firms with longer credit history are more likely to have higher leverage debt ratio than do younger firms with shorter credit history (Diamond, 1991; Petersen and Rajan, 1994, 1995). The legal form of organization, especially the sole proprietorship, has been shown by Wu and Chua (2004a) to have a joint effect with gender on the use of debt of SMEs. As indicated by the small business financing literature (e.g., Berger and Udell, 1995, 1998; Wu and Chua, 2004a, 2004b), both number of employees and total assets can measure firm size, but we choose to follow the SME defined by Industry Canada according to the former factor. Sample firms are classified into 20 categories in the survey according to the SIC code, and therefore, 19 industry dummies are constructed. Other variables such as home-based activities and the stage of development have also been considered by previous studies.

**Firm Owner Characteristics** Firm owner related control variables include: age of owner (AGE-OWNER), years of experience in the firm (FIRM EXPERIENCE), years of experience in the industry (IND. EXPERIENCE), education (POST SECONDARY, HIGH SCHOOL, and ELEMENTARY), owner's mother tongue (ENGLISH, FRENCH, and others). All of these variables have been used to study small business debt financing in the literature, and appropriate number of dummy variables have been assigned to each categorical variables.

**Lender's Characteristics** Debt financing through some types of lenders may be more accessible than through others (Petersen and Rajan, 1994, 1995). The lenders are categorized into six groups, CANDIAN BANK, FOREIGN BANK, CREDIT UNION, CPD, TRUST COMPANY, and others, and therefore five dummy variables are constructed.

### **3.3 Methodology: *Boosting***

Financial economists have realized that sample selection bias and multi-collinearity generated by high correlation between different variables may cause a serious bias in the statistical results. For instance, Petersen and Rajan (1994), Cavalluzzo et al. (2003), and Wu and Chua (2004a, 2004b) point out the step-wise relationship among the three dimensions measuring accessibility of SMEs to short-term debt financing. For another instance, Cavalluzzo et al. (2003) claim the

correlation between race and risk control, and Wu and Chua (2004a) find the joint effect between gender and the legal status of organization. Although advanced econometrics methods have been adopted to deal with these potential problems, researchers cannot guarantee to complete separation of highly correlated variables. A potential solution to these problems could be a new, simple but powerful statistical procedure, *Boosting*, is introduced to the finance literature for accurate prediction, classification and regression.

*Boosting* roots in a theoretical “PAC” learning framework (Valiant, 1984), and was first developed by Schapire (1990) in constructing a so-called “Strength of Weak Learnability” (SWL) theorem showing the increasingly performance improvement of a weak learner through “training two classifiers on filtered versions of the input data stream” (Friedman, Hastie and Tibshirani, 2000, page 341). Based on Freund’s (1995) “Majority Vote” theorem, Freund and Schapire (1997) improve Schapire’s SWL theorem and present the Discrete AdaBoost Algorithm (DAA) for further reducing the training error and providing an accurate prediction. A generalized version of Real AdaBoost Algorithm (RAA) is presented by Schapire and Singer (1998), but no qualitative change has been made by then. A widely-accepted seminal work is Friedman, Hastie and Tibshirani (2000) which propose an optimized AdaBoost Algorithm (OAA), which is “an optimization method for finding a classifier that minimizes a particular exponential loss function” (Ridgeway, 1999, page 172), to “fit an additive model ... using a criterion similar to, but no the same as, the binomial log-likelihood” (Friedman, Hastie and Tibshirani, 2000, page 341). For a detailed review for the history of *Boosting*, see Freund and Schapire (1999), Ridgeway (1999), and Friedman, Hastie and Tibshirani (2000).

To apply this statistical procedure *Boosting* into financial economics, we recognize that it is “a general and provably effective method of producing a very accurate prediction rule by combining rough and moderately inaccurate rules of thumb in a manner” (Freund and Schapire, 1999, page 771), and it maximizes a Bernoulli likelihood through a powerful learning procedure by optimizing the iteration steps and valuable information carried by input data stream. In the prediction accuracy, it outperforms the Bagging procedure, which is based on the Bootstrap aggregation, proposed by Breiman (1996) to reduce the prediction variance because of its specific optimization method. Bootstrapping is “a special Monte Carlo method designed to reduce the influence of assumptions made about the parameter values and the error distribution” (Kennedy, 1998, page 31). The Bagging procedure takes an equally weighted average of results from each iteration step, while the *Boosting* uses an unequally weighted average of them according to its optimization method. This is

why *Boosting* is able to improve its prediction accuracy significantly with optimizing the number of iterations, and becomes increasingly popular in the “mainstream statistics research” and “machine learning community” (Ridgeway, 1999, page 172). A detailed comparison between Bagging and *Boosting* is provided by Vuong (2003).

Adopting *Boosting* into the current research can help avoid the potential sample select bias and multi-collinearity caused by high correlation between variables through its powerful learning procedure and its optimization function. This is also the advantages given by *Boosting* over other traditional models in advanced econometrics for prediction. Program codes are developed in RGui 1.9.1, and they are available from the authors. Influences of the three factors on the accessibility of SMEs to short-term debt financing are examined by *Boosting* classification because of the dummy dependent variables, while those on the debt use and price charged are examined by *Boosting* regression because of the continuous dependent variables.

To test the influence of family business on SME debt financing for each of the five dependent variables (APPLICATION, APPROVAL, SATISFACTION, DEBT RATIO, and COST2000), we construct the training model using observations with a value of 0 for FAMILY (non-family-owned-and-managed firms), predict estimated values of dependent variables for family-owned-and-managed firms based on the trained model, and compare them with the observed values of corresponding dependent variables. To test the racial effect and the gender effect, we repeat the same procedures by training model using observations with male firm owners and those with owners not in the visible minority group, and test on the rest, respectively. Technically, the above three steps are expressed as:

- Step 1: Model Training: To obtain the predicted values of  $(\hat{\alpha}, \hat{\beta}_1, \hat{\beta}_2)$ , where  $\beta_2$  and  $\hat{\beta}_2$  are vectors.

$$Dependent\ Var.(training\ group) = \alpha + \beta_1 * Independent\ Var. + \beta_2 * Control\ Var. + \varepsilon$$

- Step 2: Model Testing: To obtain the predicted values of dependent variables (testing group).

$$Predicted\ Dependent\ Var.(testing\ group) = \hat{\alpha} + \hat{\beta}_1 * Independent\ Var. + \hat{\beta}_2 * Control\ Var.$$

- Step 3: Value Comparison Between Observed and Predicted Values Using Small Sample Hypothesis Test (SSHT): To examine the influences of family business, racial effect and gender effect on small business debt financing.

In examining the influences of three factors on the accessibility of SMEs to short-term debt financing, *Boosting* classification is used to obtain predicted values of dependent variables, and the misclassification rate is used to measure the effects. In examining their influences on debt use and price charged in debt financing, *Boosting* regression is used to obtain predicted values of dependent variables, and the SSHT is used as a T-test for comparison due to the small number of observations in the testing group<sup>7</sup>.

The validity of using this methodology is guaranteed by a preliminary test in which part of the non-family firms in the sample are randomly divided into two groups with 80 percent of them in one group and the rest in the other. Using the bigger group of non-family firms for training and testing on the smaller group of non-family firms, we find that the predicted values of each dependent variable of the testing group of non-family firms are not significantly different from their observed values. Similar results are obtained when we repeat the above procedures for male-owned SMEs and firms whose owners are not in the visible minority group. Thus, we conclude that *Boosting* is valid to conduct the current study which examines the family business effect, racial effect and gender effect on small business debt financing.

Robustness test is conducted through including different combinations of variables and number of iteration steps into model training and model testing. Two alternative combinations are used, and they are a combination of all variables and 100 iterations and another of variables with valuable information<sup>8</sup> selected by *Boosting* and the optimal number of iteration steps. Although the latter group gives lower training error and prediction error, no qualitative change is found. Therefore, we only present the results generated by optimized *Boosting* procedures.

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<sup>7</sup>The condition of using the SSHT is to assume a normally-distributed population without knowing its mean and standard deviation, and its formula for *T*-distribution is

$$t = \frac{\bar{y} - \mu_0}{s/\sqrt{n}},$$

where  $\bar{y}$  is the mean of predicted values,  $\mu_0$  is the mean of true observations,  $s$  is the standard deviation of predicted values, and  $n$  is the sample size.

<sup>8</sup>Whether a variable should be left in the training model and testing model is judged by their relevance scores. If the score of a variable is greater than 1, it is considered a variable with valuable information and is included in the model, otherwise it is excluded.

## 4 Statistical Results and Analysis

### 4.1 Descriptive Analysis

Table 1 presents the descriptive statistics of selected variables for the sample firms. 54 percent of the firms applied for a LOC during the period 1998-2000, and 85 percent of those who applied were approved. Note that the low denial rate strongly suggests the self-rationing of SME owners who thought that their applications were likely to be rejected. This has also been pointed out by Wu and Chua (2004a, 2004b). Among those sample firms whose applications were approved by commercial lenders, 44 percent of them were totally satisfied by the terms of borrowing, including the amount approved relative to that requested, interest rate charged, and service fees imposed. The average of leverage taken by sample firms in Year 2000 was that 48 percent of total assets were financed by debt, and the average interest rate charged by lenders was 9 percent.

36 percent of sample firms were family-owned-and-managed and are considered founding family businesses. 12 percent of the sample firm owners belonged to a visible minority group, and 78 percent of the sample firms are male-owned.

The average levels of satisfaction of sample firm owners with their relationships with commercial lenders ranged from 3.26 to 3.60 out of 5, slightly above the midpoint, and the that with the guarantee required by commercial lenders was slightly lower than 3. 32 percent of the firms' board of directors met more than twice a year in Year 2000. 58 percent had an unrelated person in charge of finance and/or accounting matters. 30 percent of the owners used personal credit to help finance the business, 84 percent of the owners were the founders.

On average, sample firms hired 22 employees in Year 2000, and 19 percent of them had sole proprietorship. 5 percent of sample firms are on the start-up stage, 71 of them are growing, and 17 percent of them are mature. The average age of firm was 15 years old, while that of firm owner was 46.8. The average year of experience of these firm owners in the firm was 2.8 years, and that in the industry was 20.45 years. 35 percent of these firm owners had the highest education from high schools, and the mother tongue of 58 percent of them was English. 78 percent of the firm borrowed from Canadian banks.

### 4.2 Accessibility of SMEs to Short-Term Financing

Applying the *Boosting* classification, we examine the family business effect, the racial effect and the gender effect on the accessibility of Canadian SMEs to short-term debt financing, and results

are presented in Table 2. The misclassification rate for LOC application in the group of family business is 31.88 percent, which means that 98 out of the 298 sample firms in the testing group did not apply for LOCs to commercial lenders, although they should have done so according to the predicted results from the training group with non-family businesses. This is mainly due to the complex motives of family business, and they would like to keep control on the firm ownership and management. It is consistent with conclusions made by Mishra and McConaughy (1999) in that family firms are less likely to use short-term debt financing due to various reasons such as the possible presence of more stringent covenants, uncertain refinancing rates, and the risk of not being able to renew the short-term debt.

We also find that the misclassification rate for LOC application in the group of firm owners with visible minority is 24.30 percent, and that in the group of female-owned SMEs is 27.45 percent. These results indicate that 24.30 percent of SME owners with visible minority should have applied for LOCs according to the model trained by the sample firms whose owners are not in the group of visible minority, but they did not. Similarly, 27.45 percent of female SME owners should have done so but they did not. These are mainly due to self-rationing. SMEs with female owners and/or owners in a visible minority group are more likely to have fear of denial. This conclusion has been strongly supported by Cavalluzzo et al. (2003) using US data, and Wu and Chua (2004a, 2004b) have pointed this out in Canadian cases.

As shown in the literature on the accessibility of SMEs to short-term debt financing, however, the loan denial (e.g., Cavalluzzo, Cavalluzzo and Wolken, 2003) and the satisfaction of SME lenders with the terms of borrowing offered by commercial lenders (e.g., Wu and Chua, 2004a, 2004b) are also crucial. Applying the *Boosting* classification again, we find that only 3.05 percent of family-owned-and-managed firms did not get approved for the LOCs in the sample period according to the prediction from the training group with non-family firms, and 7.41 percent of SMEs lenders in the visible minority group and 2.70 percent of the female owners are mis-classified. In addition, applications from these misclassified SMEs should have been approved according to the predicted results, but they actually were not. Note that these results may not be reliable due to the self-rationing as indicated by Wu and Chua (2004b). Those firms who thought their applications would be turned down had not applied, and this has been supported by the high misclassification rate while examining the racial effect and gender effect on LOC applications.

In examining the family business effect, racial effect, and gender effect on the level of satisfaction of SME lenders with the terms of borrowing offered by commercial lenders, large classification rates

are found. 52.74 percent of the family business owners were not satisfied, although the predicted results show that they should have been. As indicated by Anderson, Mansi and Reeb (2003), large public family businesses have a lower agency costs, and therefore they expect to get better terms of borrowing from commercial lenders. Empirical results in these study shows, however, that in the view of commercial lenders, the agency effect of family ownership and management in SMEs is not as large as that of the founding family ownership in large public firms. This is mainly because the private information held by small family firms is very difficult accessed by commercial lenders, and therefore, the monitoring requirements dominate the agency costs reduced by the complex motives generated by family ownership and management.

Racial effect and gender effect on the accessibility of Canadian SMEs to short-term debt financing are strongly supported by statistical results. We find that 56.25 percent of SME owners in the visible minority group were not satisfied, and neither were 48.03 percent of the female owners. If all other factors are controlled in prediction by *Boosting* classification, more than half of the SME owners with visible minority are not satisfied with terms of borrowing offered by commercial lenders, while slightly lower than a half of female SME owners are not, either.

Three main contributions have been made by the current study to the literature on the accessibility of SMEs to short-term debt financing. First, we show the racial effect and gender effect on it in Canada SMEs, and this has not been done before. Second, we follow Wu and Chua (2004b) to consider the step-wise relationship among the three dimensions measuring the accessibility so that reliable results are obtained. Our results do not only strongly support the racial effect on the accessibility of small business to short-term debt financing found in the US (e.g., LaCour-Little, 1999; Cavalluzzo, Cavalluzzo and Wolken, 2003) using Canadian data, but also clarify the puzzle of the gender effect on it. Third, Canadian data show that the effect of family ownership and management in SMEs is not the same as that of large public firms from the lender's point of view.

### **4.3 The Use of Debt and Cost of Debt Financing in Canadian SMEs**

As indicated by the literature on small business debt financing (e.g., Petersen and Rajan, 1994, 1995; Berger and Udell, 1995, 1998; Wu and Chua, 2004a, 2004b), however, issues in debt financing also include the use of debt in capital structure and the interest rate charged by commercial lenders. Table 3 presents the family business effect, racial effect and gender effect on the use of debt and cost of debt financing of Canadian SMEs.

As shown in the first column of Table 3, the family business effect on the use of debt in

Canadian SMEs' capital structures is significant at the 5 percent level, while that on the cost of debt financing charged to Canadian SMEs is not significant. This indicates that the agency effect generated by family ownership and management is important from the SME borrowers' point of view and therefore Canadian family firms use more debt than non-family firms. On the other hand, however, the agency effect of family business is not significant in the view of commercial lenders, and this is consistent with what has been shown in the case of SME's accessibility to short-term debt financing. These results of family business effects on SME debt financing illustrate some special features of small family firms.

The racial effect is shown to be significant at the 1 percent level on the use of debt in Canadian SMEs, but not significant on the cost of debt financing charged to Canadian SMEs. Empirical results obtained from predictions using *Boosting* regression show that Canadian SMEs whose owners are in the group of visible minority takes lower risk by using less debt, but little evidence shows that there is a discrimination in firm owners' attributes in terms of visible minority. This is theoretically consistent with adverse selection in the agency theory (e.g., Akerlof, 1970; Jensen and Meckling, 1976; Stiglitz and Weiss, 1981) and empirically consistent with results obtained by Cavalluzzo et al. (2003).

As shown by empirical results from prediction conducted by *Boosting* regression, gender effect on Canadian small business debt financing is significant at the 10 percent level on the use of debt and at the 1 percent level on the cost of debt financing charged to SMEs. The former part is consistent with the second-order gender effect on the use of debt in Canadian SMEs shown by Wu and Chua (2004a), while the latter part further supports the gender effect on small business debt financing and further clarify the puzzle on it.

In summary, the family business effects on small business debt financing in Canadian SMEs has some special features that are different from those in large public firms. Anderson, Mansi, and Reeb (2003) conclude that founding family ownership can lower agency cost of debt financing in US large public firms, but the monitoring costs required to access private information in Canadian small family firms dominates the benefits of lower agency costs in debt financing offered by the family ownership and management. This results in the insignificant family business effect on small business debt financing in the view of commercial lenders, although the agency effect generated by family ownership and management from the SME borrowers' point of view is as significant as that in large public companies. Racial effect and gender effect on the use of debt in small businesses have been shown by US researchers, but little evidence of these two effects on the interest rate

charged to SMEs have been observed using the US data. Wu and Chua (2004a) show the second-order effect on the leverage in Canadian SMEs using advanced econometrics methods. Empirical evidence obtained in the current study is consistent with what has been found in the literature on the racial effect, and strongly supports the gender effect on small business debt financing on both the use of debt and the cost charged to Canadian SMEs. In a word, both Hypothesis 1 and Hypothesis 2 are partially rejected, while we fail to reject Hypothesis 3.

## 5 Conclusions

Using unique survey data collected by Industry Canada and a Monte Carlo-based new powerful statistical classification and regression tool, *Boosting*, we examine the family business effect, the racial effect and the gender effect on different aspects Canadian small businesses debt financing in the agency framework. Issues relating to debt financing examined in the study include the accessibility of Canadian SMEs to short-term debt financing, the use of debt in the capital structure, and the interest rate charged to Canadian SMEs.

Three major findings can be summarized from the current study based on Canadian data. First, on the accessibility of Canadian SMEs to short-term debt financing, we find that all of the family business effect, the racial effect and the gender effect are significant by following Wu and Chua (2004a, 2004b) to consider the step-wise relationship among three dimensions of measuring the accessibility to short-term debt financing. Second, on the use of debt in Canadian SMEs' capital structures, both significant racial discrimination and significant gender discrimination are found, while an insignificant family business effect in the view of institutional lenders and a significant one in the view of SME borrowers have been observed. Third, on the cost of debt financing charged to Canadian SMEs, little evidence for the family business effect and for the racial effect have been found, but a significant gender effect has been shown. In summary, gender discrimination on all aspect of small business debt financing has been shown using Canadian data, and it clarifies the puzzle existing in the small business debt financing literature. Evidence for racial discrimination is consistent with the literature both theoretically and empirically, while some special features of family business effects in SMEs, which are different from those in US large public enterprises, are indicated by strong statistical results.

The current study add to the growing body of the literature on discrimination in small business debt financing by providing new and strong evidence from Canadian data, and shed light on influ-

ences of family ownership and management on SMEs' debt financing through their observed credit market experience. It contributes different fields of the business management literature including finance, entrepreneurship, small business management, and family business.

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**Table 1. Selected Descriptive Statistics**

	N	Mean	S.D.		N	Mean	S.D.
<b>Dependent Variables</b>				<b>Control Variables - Firm</b>			
APPLICATION	2,106	0.54	0.50	AGEFIRM	2,074	15.00	15.61
APPROVAL	1,137	0.85	0.36	EMPLOYEES	2,076	22.36	45.67
SATISFATION	918	0.44	0.50	SOLE	2,097	0.19	0.39
DEBT RATIO	490	0.48	0.29	METROP	2,116	0.20	0.40
COST2000	226	0.09	0.65	STARTUP	2,072	0.05	0.22
<b>Independent Variables</b>				GROWING	2,072	0.71	0.45
FAMILY	805	0.36	0.48	MATURE	2,072	0.17	0.37
MINORITY	1,998	0.12	0.33	<b>Control Variables - Firm Owner</b>			
GENDER	2,093	0.78	0.41	AGEOWNER	2,031	46.80	10.77
Control Variables - Agency				FIRMEXP	2,101	2.80	1.44
RELATION1	1,273	3.29	1.27	INDEXP	2,072	20.45	11.61
RELATION2	1,265	3.26	1.19	HIGHSCHOOL	2,083	0.35	0.48
RELATION3	1,275	3.60	1.26	ENGLISH	2,092	0.58	0.49
GUARANTEE	1,291	2.96	1.38	Control Variables - Lender			
BMF2000	2,088	0.32	0.47	CANBANK	2,104	0.78	0.42
PERSONAL	2,078	0.30	0.46	FOREIGNBANK	2,104	0.02	0.13
REPORTING	2,097	0.58	0.49	CREDITUNION	2,104	0.07	0.25
FOUNDER	2,095	0.84	0.37	CPD	2,104	0.11	0.32

**Table 2. Misclassification Rates (MR): Accessibility to SME Debt Financing**

	APPLICATION		APPROVAL		SATISFACTION	
Family	MR	31.88%	MR	3.046%	MR	52.74%
Business	N (Testing)	298	N (Testing)	197	N (Testing)	292
Racial	MR	24.30%	MR	7.407%	MR	56.25%
Effect	N (Testing)	753	N (Testing)	27	N (Testing)	32
Gender	MR	27.45%	MR	2.703%	MR	48.03%
Effect	N (Testing)	153	N (Testing)	111	N (Testing)	152

**Table 3. Small Sample Hypothesis Test: Debt Use and Cost of Debt Financing**

		Family Business	Racial Effect	Gender Effect
Use of Debt	Mean (Obs.)	0.561	0.507	0.617
	Mean (Testing)	0.506	0.608	0.577
	S.D. (Testing)	1.146	0.040	0.145
	N (Testing)	32	9	25
	<i>t</i> -Value	2.1262**	7.512***	1.3945*
Cost of Debt Financing	Mean (Obs.)	0.068	0.049	0.115
	Mean (Testing)	0.119	0.069	0.068
	S.D. (Testing)	0.263	0.467	0.078
	N (Testing)	32	9	20
	<i>t</i> -Value	-1.0924	-0.1279	2.7058***

\* indicates the significance at the 10 percent level;

\*\* indicates the significance at the 5 percent level;

\*\*\* indicates the significance at the 1 percent level.