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Incrementality of SME Loan Guarantees

ABSTRACT. In many countries, loan guarantee programs are important elements of government policy with respect to small- and medium-sized enterprises (SMEs). If loan guarantee schemes are to be effective, a majority of firms obtaining assistance through such a scheme ought not to be able to obtain financing from existing sources: a property known as incrementality or additionality. This paper describes a new approach to measuring incrementality. This work uses a two-stage process to estimate the incrementality of loans made under the terms of the Canada Small Business Financing (CSBF) program. First, a logistic regression-based model of loan outcomes (essentially a credit-scoring model) is estimated based on a large representative sample of SMEs. The resulting model was consistent with prior expectations and exhibited high levels of goodness-of-fit. The model was then employed to classify a sample of firms that had received loans under the terms of the loan guarantee scheme. Incremental loans ought to be classified as ''turndowns'' by the model; hence the proportion of loan guarantee recipients that the model classified as turndowns is a direct measure of incrementality. For the CSBF loan guarantee program incrementality was estimated (with 95% confidence) as $74.8 \pm 9.0\%$.

KEY WORDS: additionality, incrementality, small business, loan guarantees

JEL CLASSIFICATION: G18, G28, M13, O17

1. Introduction

It is generally recognized that a substantial amount of job creation is attributable to the growth of small- and medium-sized enterprises (SMEs). While debated, many perceive this growth to be obstructed by imperfections in the credit market such that smaller firms face disproportionate access to the debt capital needed for start-up, growth, and survival (see seminal papers by Stiglitz and Weiss, 1981, 1983; Parker, 2002; Cressy, 2002 for recent reviews of this literature). To address these perceived imperfections, governments and trade associations have often intervened in credit markets using loan guarantee programs (Llisteri, 1997; Levitsky, 1997a, 1997b). Llisteri (1997) documents use of such schemes in most countries in South America, Europe, Southeast Asia, as well as in North America. One of the key issues with respect to debates about these interventions is the extent to which the loan guarantees provide for financing that, otherwise, would not have been available. This property of the programs is known as ''additionality'' in the UK and Europe and as ''incrementality'' in North America. The extent to which the provision of capital that is not incremental to that already available reflects ''a waste of the scarce resources available to Government'' (KPMG, 1999, p. 199).

This paper describes a new approach to the measurement of incrementality, specifically in the context of the Canadian loan guarantee program, the Canada Small Business Financing (CSBF) Program. The paper opens with a short description of generic features of loan guarantee programs and outlines the agency relationships among the borrowers, the guarantor, and the delivery agents. Next, a detailed description of the CSBF loan guarantee scheme is advanced because it is this program that is the subject of incrementality assessment by this paper. This is followed by a review of the literature on measurement of incrementality (additionality). The subsequent sections present the methodology and empirical findings of the analysis. The paper closes with a discussion of the implications of these findings and recommendations for future research.

2. Generic features of loan guarantee schemes

Cowling and Mitchell (2003, p. 63) have pointed out that loan guarantee schemes are ''an integral

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part of SME policy in both developed and developing countries" and note that "little has been done to evaluate such programmes." All loan guarantee programs involve at least three parties: borrower, lender, and guarantor. The motives of the three participants differ. The borrower is typically an SME seeking debt capital who approaches a lender for a business loan. The lender is most often a private financial institution seeking to profit from the loan transactions. Faced with information asymmetry, lenders look for signs of creditworthiness from borrowers. For new or small businesses the high-fixed costs of evaluation may prompt the lender to refuse a loan application. Alternatively, the parties may resort to a third-party guarantee of the loan.

The guarantor, usually government or a trade association, is typically seeking to facilitate access to debt capital in the economy by providing lenders with a guarantee for some portion of the loan and (often) for accrued interest. This access to debt capital achieves economic goals such as:

1. expansion of the volume of lending to SMEs (Cowling and Mitchell, 2003),
2. increases in employment and in tax revenues from the business and its employees (Riding and Haines 2001; Bradshaw, 2002);
3. (possibly) increases in exports of goods and services (Bradshaw, 2002);
4. banks potentially profit from the development of a relationship with SMEs. Hence, guaranteed loans are sometimes used to generate new customers who may develop strong relationships with the lender and provide the lender with ancillary sources of profit from both commercial and personal banking services.

This generic arrangement implies an agency relationship between the guarantor and the lender, in addition to that between lender and borrower. The lender acts as a delivery agent of the loan guarantee for the guarantor. To accomplish its objectives the guarantor must design the parameters scheme to align its objective with the motives of the lenders (making profitable loans). In the context of this agency relationship, the guarantors can typically manage the following parameters:

1. *The degree of discretion in credit decisions*. In some jurisdictions the lender decides which borrowers receive guaranteed loans. In others the guarantor reviews – at least notionally – each application.
2. *The level of the guarantee*. This parameter also varies by jurisdiction and within jurisdictions. For example, prior to 1982 the guarantee level for US SBA loan guarantees was 90%. When the US SBA introduced its "Preferred Lender" program (for which SBA approval of a given loan was automatic) in 1982, the guarantee was reduced to 75% of the debt.
3. *Fees*. Typically, guarantors set fees in an attempt to recover costs of honouring defaults or to preserve the integrity of the pool of capital that, in some implementations, often lies behind the guarantees.
4. *Eligibility criteria*. In most implementations, guarantees may not be permitted for certain purposes of borrowing. In Canada, for example, guarantees are not available for loans used to support working capital.

These parameters vary across loan guarantee schemes according to the setting and objectives of the participants. The objectives upon which loan guarantee programs are based can differ substantially. Countries establish loan guarantee programs for a variety of reasons and the rationales impact directly the extent to which the guarantor is concerned with loan incrementality. Some countries design loan guarantee and risk sharing programs primarily to augment the financing available to small business (e.g., Canada, France, UK). In other countries, loan guarantees are designed to act as lenders of last resort, offering the loan guarantee only when SMEs fail to obtain other sources of financing (e.g., US). Some of these programs actually require that the applicant has officially been turned down for financing by commercial lenders. Other countries (e.g., Japan, see Nitani and Riding, 2005) use loan guarantees to provide funding to forestall the failure of small firms that would otherwise go under. As a result of the diversity of objectives, incrementality may be left undefined or defined in terms of program impacts according to each jurisdiction's objectives.

There are also wide differences in the way loan guarantee programs are administered. In some countries lending institutions are fully responsible for credit decisions and for approving and administering the loans and the guarantees. In contrast, loan guarantee administrators in other jurisdictions play an active role in evaluating each and every loan guarantee application. Doing so affords the program administrators the opportunity to ensure loan incrementality at the time the loan is granted: because program administrators review individual loan applications, it is argued that they can ensure incrementality when approving applications.

2.1. *The Canadian Loan Guarantee Program*

The Small Business Loans Act (SBLA) of 1961 embodied the original legislation related to the primary loan guarantee program extended to small businesses by the Canadian federal government. The then-stated (1961) goal (which has remained unchanged) was to "increase the availability of loans for the establishment, expansion, modernization and improvement of small business enterprises" (Industry Canada, 1998, 2002). The rationale for this intervention rested in the perception that the lack of financing on reasonable terms and conditions was a significant barrier to the growth of small businesses. Because small businesses make a significant contribution to the Canadian economy, it was thought that an intervention was required to ensure access to debt capital on reasonable terms and conditions.

Since its inception the SBLA program evolved, effective April 1, 1999, into the CSBF Program. Over the course of time, several of the program parameters have been modified; however, the various amendments over the years have left unchanged the core objectives and principal mechanisms of the program. As currently instituted any (non-farm) profit-oriented business with annual sales of less than $5 million can apply for a CSBF-guaranteed loan of up to $250,000. The financing, which is limited to term loans, may be used for the purchase and improvement of premises and equipment, the purchase of land, or to make leasehold improvements (but not for working capital). The current level of guarantee is for 80% of the outstanding balance on the loan.

The CSBF program is designed so that the lender-borrower dyad have (subject to eligibility requirements, see above) complete discretion as to whether or not the CSBF guarantee is invoked. Accordingly, there is no direct oversight by the government. The government acts as a passive guarantor unless the loan is defaulted. As a result, the guarantor delegates the assessment of incrementality to the lender/borrower dyad and has no

TABLE I
Type of loans sought during 2000[a]

Type of loan application	Number of cases in sample	Percent of cases in sample	Weighted number of cases	Weighted percent of cases
Term loan	982	33.5	64,765	29.7
Mortgage loan	241	8.2	20,135	9.2
New LOC	861	29.4	70,035	32.1
New credit card	134	4.6	12,215	5.6
LOC increase	389	13.3	26,916	12.4
Other type of loan	128	4.4	7,762	3.6
Loan package	197	6.7	16,013	7.4
Total	2,932*	100.0	217,841	100.0

[a]Not all 3,225 respondents identified the type of financing they sought. In collecting the data, Statistics Canada employed stratified random sampling techniques in order to ensure that they obtained minimum sample sizes for particular combinations of firm size and sectors. Thus, the data are collected in strata, each defined by the combination of firm size and sector. To make the stratified sample reflect the underlying population of Canadian SMEs, each strata is assigned a weighting and subsequent analysis must account for these weightings.
Source: FDI 2001 Demand-side Survey.

direct means of verifying the degree to which any loan is incremental. The borrower pays a 2% registration fee and an additional annual fee with both fees being passed on from the borrower to the guarantor. This makes it difficult for the guarantor to assess the incremental costs and benefits associated with the loan and prompts a need to measure incrementality.

3. Review of literature on incrementality

3.1. *Theoretical rationale for loan guarantee programs*

Even though the introduction of many loan guarantee programs pre-date the economic theory, the theoretical rationales for these interventions are often vested in the concept of credit rationing. This concept arises from the seminal works of Stiglitz and Weiss (1981, 1983). In their 1981 paper, Stiglitz and Weiss use a theoretical framework to show conceptually that credit rationing could result from adverse selection and moral hazard: that credit rationing is a consequence of lenders' response to adverse selection and lenders do not set interest rates to their market clearing level. Besanko and Thakor (1987), Bestor (1985), and many others have extended these theoretical positions. While conceptually strong, these concepts have proven difficult to test empirically. Parker (2002) and Cressy (2002), in their respective reviews of the literature, do not support that credit rationing is such that interventions are warranted.

Bradshaw (2002) suggests that loan guarantee programs actually may be of direct financial benefit to society through job creation and additions to the tax base. Similar findings were reported by Riding and Haines (2001). However, Vogel and Adams (1997) maintain that the inability to measure incrementality accurately renders inadequate all evaluations of the effectiveness of credit guarantee schemes. They assert that no guarantee program had adequately documented additionality and argue that problems arise from two sources. First, Vogel and Adams note the "counterfactual problem": it is impossible to know what the lender would have done in the absence of the loan guarantee program so it is difficult to attribute benefits to the guarantee scheme. Second, Vogel and Adams note potential substitution problems stemming from intra-portfolio substitution by lenders: lenders may make multiple loans to individuals to fit them under a loan-size ceiling specified in the loan guarantee program; or, lenders may redefine the purpose of existing loans to qualify borrowers for the loan guarantee. Moreover, it is conceivable that lenders might employ "column-shifting", moving distressed loans into the guaranteed portfolio. These problems affect the accuracy of measuring loan incrementality because – if true – firms are already providing access to credit under existing lending institutional parameters and lenders are merely taking advantage of the guarantee program to reduce risk that they might otherwise have been willing to take in the absence of the program.

The usual definition of incrementality is: loans facilitated through the program ought not otherwise have been available to the borrowers. However, Meyer and Nagarajan (1996) identify additional forms of incrementality:

- providing for a loan on more favourable terms (maturity, interest rate, etc.) than would otherwise have been granted;
- providing for credit on a more timely basis;
- facilitating or initiating the working relationship between a business and a lender; or
- providing for a broader financing package than would otherwise have been available.

Accordingly, measurement of incrementality is not straightforward and different forms of incrementality have been identified.

3.2. *Measurement of incrementality*

Measurement of incrementality is particularly important for many types of government interventions. In the case at hand, incrementality must be defined in terms of the explicit objective of the Canadian program, namely "to increase the availability of loans [to small firms]." Before proceeding to a discussion of incrementality, it is worth commenting on the stated objective. This objective is explicit in the Canadian implementation of a loan guarantee scheme but it is also common to many other such interventions in

other countries. Nitani and Riding (2005, p. 56) list seven developed countries in which this goal is also explicit, including the US, the UK, the Netherlands, and Germany. In France, guarantees are administered by trade associations for the same purpose. Whether or not this objective has merit is itself subject to debate. Two extreme points of view are readily identifiable.

On the one hand are those who would argue that interventions to augment lending from the commercial sector is wrongheaded. Among these, Vogel and Adams (1997) contend that interventions into a market can only be justified if an imperfection is present and that the nature of the intervention should directly address the imperfections. Vogel and Adams would argue that no imperfection have been identified and that loan guarantee schemes are therefore unjustifiable. Rhyne (1988) illustrates further this perspective when she quotes Stockman (1987) as follows:

> *"... these programs [SBA] may inflict unfair private economic harm: the 99% of unsubsidized small businesses ... undoubtedly face downward pressure on market shares, profits and return on investment owing to the artificial presence of government fostered and subsidized competitors"*. (David Stockman, director, Office of Management and Budget, quoted in U.S. Congress, House Committee on Small Business, Financial Assistance Program Termination, Hearings, 99th Cong., 2nd sess., 1986, pp. 153–154, as quoted in Rhyne, 1988, p. 1.)

On the other hand, loan guarantee programs have been justified by the observation that fixed costs of due diligence militates against commercial lenders even considering relatively small lending balances. Others (Riding and Haines, 2001) document that loan guarantee schemes generate societal benefits that exceed the costs. Again, Rhyne (1988) resorts to the debate in the US Congress to illustrate this perspective:

> *"The [SBA] loan guarantee program is a vital source of long term capital for this country's small business community. It is a program which generates revenues in excess of its costs to the government and is an excellent partnership between the public and private sectors"*. (Brooks H. Brown, vice-president, Allied Lending Corporation, quoted in U.S. Congress, House Committee on Small Business, Summary of Activities, 99th Cong., 2nd sess., January 1987, H Rept. 99-1036, p. 344, as quoted in Rhyne, (1988, p. 1.)

This debate makes accurate measurement of incrementality all the more important. Even if economic theory suggests that interventions are not justified, the presence of demonstrable societal benefits from such programs provide an argument for re-examination of the economic theory. To measure the net costs and benefits, a defensible measure of incrementality is essential.

Therefore, returning to the primary focus (measurement of incrementality in the context of a stated objective to increase the availability of loans), loan guarantee schemes are incremental if the majority of firms obtaining assistance through the scheme have been unable to obtain financing from alternative sources. That is, lending under the terms of the loan guarantee program ought to be additional, or incremental, to the lending already available in the credit market. Measuring incrementality however, is fraught with methodological challenges.

Much of the most current understanding of incrementality emerged from discussions at the Roundtable on Credit Guarantee Systems held at the Inter-American Development Bank (see, e.g., Arrau, 1997; Castellanos 1997; Gudger, 1997; Hatakeyama et al., 1997; Holden, 1997; Levitsky, 1997a, 1997b; Llorents, 1997; Marulanda-de-Garcia, 1997; Oehring, 1997 among others). As correctly noted by Vogel and Adams (1997), measuring incrementality requires an assessment of what would have happened if what did happen had not happened.

Perhaps the most well-known attempt to evaluate incrementality was that undertaken by KPMG (Clark et al., 1998) in their evaluation of the Loan Guarantee Scheme (LGS) administered by the Department of Trade and Industry (DTI) in the UK, KPMG sought to measure incrementality using two complementary approaches. One approach entailed a series of "aligned interviews" in which borrowers and their

respective loan account managers were subjected to in-depth interviews about the process of applying for, and obtaining, a loan guaranteed by the LGS. This approach turned out to be a very useful means of learning about the lender-borrower relationship on the basis of rich qualitative data. As a means of assessing incrementality, however, it was subject to two shortcomings. First, this approach reflected recollected data with all of the well-known problems inherent in the use of such information. Second, the cost of collecting interview data of this type militated against obtaining a sample size that would allow estimation with desired accuracy.

The second approach used by KPMG was based on a survey of owners of the firms that had received LGS-guaranteed loans. While allowing for greater accuracy, this approach also relied on recollected data and was subject to the biases resulting from the optimism with which entrepreneurs are associated. In spite of the criticisms, the KPMG work appears to be unique in the sense that it represents the first public-domain study to even attempt to measure incrementality. In its recent review of current practices with respect to incrementality assessment, the Conference Board of Canada (2003) observed that it remains difficult to measure loan incrementality with precision because current methodology relies on the beliefs of borrowers and lenders and depends on their recollections. These problems affect the accuracy of measuring loan incrementality because firms are already providing access to credit under existing lending institutional parameters. Lenders may take advantage of the guarantee program to reduce risk that they might otherwise have been willing to take in the absence of the program.

In its study of approaches to the measurement of incrementality, the Conference Board of Canada (2003) examined 40 international studies. They found that 19 of these considered the concept of loan incrementality but that only three of the forty studies included a detailed description of methodologies used to address the concept of loan incrementality.

This paper describes the findings of an alternative approach to measuring incrementality of loan guarantees, one that is designed to overcome the problems noted above.

4. Hypotheses

The preceding discussion prompts the two following hypotheses that will be tested. Hypothesis 1 arises from the arguments voiced by Vogel and Adams (1997). Hypothesis 2 presumes that it has been shown that Hypothesis 1 has been rejected.

Hypothesis 1: It is not possible to measure incrementality with a known degree of precision.
Hypothesis 2: No incrementality exists in the CSBF program.

5. Data and methodology

The methodology used here is based on the analysis of data from a large-scale survey of SMEs borrowing experiences. The first step of the work derives a statistical model of lending outcomes based on loan applications by firms that did not use the loan guarantee scheme. This statistical approach is not unlike credit scoring models widely used in SME banking. The second step of the work uses the resulting credit scoring model to "score" a sub-sample of firms that had received loan guarantees. Thus, the model provides a prediction of what the lending decision outcome would have been in the absence of a loan guarantee program for a sample of firms that had in fact received guaranteed loans.

The data employed here were drawn from a large-scale survey conducted by Statistics Canada about the financing experiences of a large stratified sample of Canadian small firms: the Survey of Financing of SMEs. These data, and this research, reflect the cooperation of several federal government ministries (Industry Canada, Finance Canada, and Statistics Canada). The survey was conducted in 2001 and polled the owners of more than 19,000 SMEs with respect to their financing experiences during the year 2000. It comprised two stages of data collection.

The first stage sought information about SME owners' financing experiences along with extensive "tombstone" data on firm and owner demographics. Responses to this stage of data collection were received from 10,983 business owners, a 62% response rate. The second stage of the data collection sought to obtain financial statement information from these same (10,983) owners: 7,123 responses were received in the second stage of data collection. The survey was stratified so as to ensure a minimum number (among other criteria) of responses from owners of KBI businesses. Among the respondents were 3,225 respondents that reported that their firms had sought debt financing during 2000, respondents who replied in the affirmative to the following question:

> *"During 2000, did the business or its owners approach any type of credit supplier to request new or additional credit for business purposes?" (2001 FDI survey, Question C-1, p. 9.)*

Table I provides a breakdown of the types of loans sought in the year 2000 by the respondents to the survey who had sought some form of debt financing. For each responding firm, the survey reports loan application outcomes and a number of attributes of the borrower firm and its owner(s). Table II presents a list of the attributes of borrower firms and their primary owners that are available in the survey data.

Term loans are the focus of this work because term loans are the only form of financing that qualifies for the CSBF. Of the 809 term loan applications, 101 loans were identified by the respondents as guaranteed and met the eligibility requirements of the CSBF (loans were for less than $250,000 and from firms with annual sales revenues of less than $5 million). In addition, 281 other applications were not guaranteed but were from firms with annual sales volumes of less than $5 million. This subset of loan applications was used as the basis for development of the logistic regression (credit scoring) model of loan decision outcomes. Note that the

TABLE II
SME FDI baseline data items

Credit application outcomes	Business and owner attributes
• Whether or not loan application was accepted or turned down	• Legal structure of firm
• Reasons stated for loan turndown (if any)	• Age of firm
• Type of loan application (term loan, line of credit, etc.)	• Size of firm (number of employees), annual revenues
• Type of financial institution	• Number of owners
• Use(s) of loan proceeds	• Gender of owner(s), manager
• Total amount requested, amount authorized	• If primary owner is member of visible minority, aboriginal, or disabled
• Whether loan authorization was on personal or commercial basis	
• Interest rate on loans	• Age of primary owner
• Presence of loan guarantees	• Home based business or not
• Collateral requirements (value of collateral and type of assets)	• Experience of primary manager, business owner(s)
• Documents requested by lenders	• Level of managerial involvement of primary owner
• Account manager turnover	• Industrial sector
• Timeliness of lending decision	• Exporter status
• Whether lender is also majority of owners' personal banker	• Expenditures on R&D, technology acquisition
• Length of banking relationship	• Historical revenue growth
	• Key income statement and balance sheet data
	• Sources of capitalization
	• Sector (NAICS), including whether or not firm is classified as KBI according to Industry Canada's definition
	• Significant financing events during 2000

number of cases reported in the various analysis steps vary from these totals because of missing data from particular fields. In particular, recall that financial statement data was received from only 70% of respondents.

The approach to measuring incrementality using these data was a two-stage process. In the first stage, the parameters and statistical properties of a logistic regression-based model of loan decision outcomes of non-guaranteed loans were estimated. The second stage of the analysis uses the resulting model to classify a sample of CSBF loan recipients as to whether or not the firms in the sample would have been turned down in the absence of the CSBF loan-loss-sharing program. At the extreme, if the guaranteed loans were incremental and if the model were reliable, then the model would predict that all of the CSBF loans would have been turned down. The proportion of such loans that the model predicts as being turned down is, under this logic, a direct measure of incrementality.

The logistic regression model of loan outcomes employed a dichotomous dependent variable, namely whether a particular loan application was turned down or not. Independent variables were those thought to be potential determinants of the loan turndown/acceptance decision and that were available from the data. The general form of a logistic model is:

$$E\{f/n\} = e^{f(x)}/(1 + e^{f(x)})$$

where $E\{f/n\}$ is the predicted proportion of turndowns $\{f\}$ among $\{n\}$ loan applicants and $f(x) = a + \sum b_i X_i$. The method estimates the coefficients, $\{b_i\}$, of a linear function of the set of i predictor variables, $\{X_i\}$, that will, under the logistic model, best predict the proportion of borrowers for combinations of values of the set of independent variables, X_i, in the above equation. Potential explanatory variables were selected according to previous research. Among others, Haines et al. (1994), Wynant and Hatch (1991), and many finance text books and bank training materials have identified determinants of commercial lender decisions and that are logically related to the credit granting decision. The variables selected for potential inclusion in the model are listed in Table III.

In addition to the variables listed in Table III, variables were included that reflected the weighting scheme of the Statistics Canada data. Accordingly, the sample strata are reflected in this analysis by inclusion of the set of dummy variables corresponding to each size-sector stratum (Thomas, 1993).

6. Empirical findings

To develop a model of loan turndown decisions the data employed were the 281 term loan applications from the 2001 FDI baseline survey that were not guaranteed. Data were available for 277 of the 281 loans. Table IV summarizes the mean values of the variables employed here.

Estimation of the model of loan turndowns followed an iterative process. In the first iteration, logistic regression was used to estimate a model of loan turndowns as a function of all of the above variables. Table V summarizes the results of this first estimation. This full model displayed a high goodness-of-fit (Cox and Snell $R^2 = 0.63$; Nagelkerke $R^2 = 0.85$) and high in-sample predictive accuracy, correctly classifying 92.6% of the 202 loan applications used to derive the model. (Some applications were not included in the model because of missing data for one or more variables.) This is a high classification accuracy and level of fit. Nonetheless the model retains variables that were not correlated with loan outcomes to a statistically significant extent. Standard practice is then to re-estimate the model iteratively deleting one or more variables that are not statistically significant at each step. The result is the more parsimonious "reduced model" summarized in Table VI.

Table VI shows that higher loan approval rates were associated with applications for the purposes of financing real assets and working capital, businesses with longer-duration banking relationships, and larger firms (as measured here by the number of employees). Loan turndowns are more likely when the borrower has had to deal with multiple loan account managers and are especially likely for home-based businesses. The variables that measure capacity (logarithm of revenues/loan size) and productivity (logarithm of revenues/employees) are collinear

TABLE III
Variable selection and definitions

Variable	Definition and rationale
Annual gross revenues Number of employees	The level of annual sales revenues and the number of employees are measures of the size of the firm and proxy measures of the firm's amount of *capital*, one of the "5 Cs" of commercial lending. Implicit in this reasoning is the assumption that larger firms employ higher levels of capital. To better conform to the assumption of normality, these variables are transformed by calculating the logarithm of their values.
Productivity	Productivity is estimated by taking the ratio of annual sales revenues to the number of employees. This measure of *capacity* is also a measure of the firms' ability to generate income from its inputs. To better conform to the assumption of normality, this variable is transformed by calculating the logarithm of its values.
Capacity	This second measure of *capacity* is estimated by calculating the ratio of annual sales revenue to the size of the loan request. It measures the firm's ability to service the debt. To better conform to the assumption of normality, this variable is transformed by calculating the logarithm of its values.
Length of banking relationship	The duration of the borrower firm's relationship with the lender is a direct measure of the degree of information asymmetry that might exist between the lender and the borrower. As such, this variable represents a measure of *character* and provides information about the lender's ability to assess the applicant firm.
Number of loan account managers	This measure is, in a sense, the antithesis of the above measure of *character*. In previous research, it has been contended that frequent changes in loan account manager have been identified as a contributory factor in loan turndowns.
Years of owner experience	Owner(s)' experience is often cited as one of the dimensions that comprises the *character* dimension of the so-called "5 C's" of commercial lending. According to this rationale, the greater the amount of experience, the greater the likelihood of receiving credit. This variable is measured in the number of years of experience reported by the primary owner of the firm. To better conform to the assumption of normality, the variable is transformed by calculating the square root of the number of years of experience reported.
Age of majority owner	It has been suggested in the popular media that very young owners may have more difficulty securing credit than older owners. Accordingly, this is another measure of the character dimension. For this work, owner's age is expressed by two dichotomous variables. The first is set equal to 1 (and to zero otherwise) if the primary owner is less than 35 years of age. The second variable is set equal to 1 (and to zero otherwise) if the primary owner is more than 45 years of age. By including both years of owner experience and these measures of age, the potential confounding effects of age and experience might be assessed separately.
Lender is also owner's personal banker	This measure of *character* and information asymmetry is set equal to 1 (and to zero otherwise) if the lender also manages the primary owner's personal banking.

TABLE III
Continued

Variable	Definition and rationale
Home-based businesses	This measure of *collateral* is set equal to 1 (and to zero otherwise) if the firm is a home-based business. The rationale is that home-based firms generally lack the working capital and real assets that might serve as security for a loan.
Legal status	The legal status of the firm (sole proprietorship, partnership, incorporated business) is measured by two dichotomous variables. The first is set equal to 1 (and to zero otherwise) if the firm is a sole proprietorship. The second variable is set equal to 1 (and to zero otherwise) if the firm is a partnership. Limited liability incorporated businesses would be those where the values of the two variables above are both equal to zero. Because of the limited liability associated with incorporated businesses and the potential availability of the assets of multiple partners, these variables measure both *capital* and *collateral*.
Purpose of loan	Loans used to finance real assets and working capital would typically be associated with these assets' ability to provide *collateral* for the loan. The purpose of the loan financing is measured by two dichotomous variables. The first is set equal to 1 (and to zero otherwise) if the firm is financing real assets. The second variable is set equal to 1 (and to zero otherwise) if the firm is financing working capital. The reference category (financing R&D or export development) is defined when the values of the two variables above are both equal to zero.
High technology, R&D expenditures	This variable is set equal to 1 (and to zero otherwise) if the firm spends more than 5% of sales revenues on either R&D or computer technology. It is a means of measuring the extent to which the firm is technology-oriented and is an alternative means of identifying firms in knowledge-intensive sectors. As such, this variable measures the *conditions* dimension of commercial lending criteria. In addition, it reflects the BDC's assertion that such firms may be subject to "gaps" in the commercial lending market.
Rural setting	This variable also measures the *conditions* and the context for the business of the firm. It is set equal to 1 (and to zero otherwise) if the second digit of the firm's postal code is 0.
Owner is member of a visible minority	This variable is set equal to 1 (and to zero otherwise) if the owner self-identifies as such.
Variables to control for strata weighting	As noted, the sample data were collected using a stratified random sampling process where the strata are defined by the size and sector of the firms.

TABLE IV
Potential determinants of term loan outcomes

Scalar data	Ordinary term loans (N = 254 to 281)	CSBF loans (N = 94 to 101)	Total (N = 349 to 382)
Years of owner experience (SQRT)	16.4	16.2	16.3
Number of employees	35.54	19.18	31.22
Length of banking relationship	9.04	7.00	8.50
Productivity (log(sales/employee))	11.56	11.00	11.42
Capacity (log(sales revenues/loan))	1.54	1.95	1.65
Number of loan account managers	2.87	2.72	2.84
Categorical data			
Majority owner <35	10.7%	11.9%	11.0%
Majority owner >45	61.2%	53.5%	59.2%
Lender is also owner's personal banker	55.2%	58.4%	56.0%
Home based businesses	24.2%	33.7%	26.7%
Legal status:			
Incorporated	78.3%	74.3%	77.2%
Partnership	6.8%	10.9%	7.9%
Sole Proprietorship	12.5%	14.9%	13.1%
Purpose of Loan			
Real assets	61.2%	77.2%	65.4%
Working capital	25.3%	10.9%	21.5%
R&D financing	4.3%	4.0%	4.2%
High technology, R&D expenditures	23.1%	21.8%	19.0%
Rural Setting (Second digit of postal code is 0)	22.0%	26.0%	29.0%
Owned by visible minority	6.0%	11.0%	6.0%

because both use sales revenues in their respective numerators. Because of collinearity it is difficult to ascertain the directionality of the productivity and capacity measures; however, both contribute significantly to the explanatory power of the regression model. Collinearity does not impair the predictive accuracy of the model, although it will increase the standard error of the regression point prediction. For the reduced model, goodness-of-fit was almost as strong as for the full model (Cox & Snell $R^2 = 0.62$; Nagelkerke $R^2 = 0.83$) and in-sample predictive accuracy remained at a high level, correctly classifying 91.8% of the 208 loan applications used to derive the model.

6.1. *Incrementality estimation*

Based on the reduced logistic regression model described above, incrementality was estimated by applying the model to the 101 loan applications that respondents identified as having been guaranteed and which were consistent with the parameters of the CSBF. Of these 101 loans, 88 respondents provided sufficient data to apply the model. Based on these data, the logistic regression model classified 71 (81%) of these 88 loans as turndowns. After using Bayesian inference to allow for the imperfect predictive accuracy of the logistic regression model (Morrison, 1969), these results translate into a point estimate of incrementality of 74.8%. It is also essential to have a sense of precision related to the incrementality estimate. With 88 observations, these data result in a 95% confidence interval for the incrementality estimate of $74.8 \pm 9.0\%$.

7. Summary and discussion

Hypothesis 1, that it is not possible to measure incrementality, has been rejected by the methodological approach of this paper. Hypothesis 2, that there is no incrementality associated with the CSBF program has been rejected by the empirical findings of this paper.

This work has employed data from a large-scale survey of SMEs borrowing experiences to assess the degree of incrementality of loans advanced under the terms of the CSBF program during 2000. The approach to measuring

TABLE V
Full logistic regression model of term loan outcomes

	Coefficient estimate	Standard error	Wald statistic	*p*-value	Likelihood
Purpose of loan			4.430	0.109	
Real assets	−6.813	3.35	4.125	0.042	0.00
Working capital	−7.548	3.59	4.429	0.035	0.00
Length of banking relationship	−0.111	0.06	3.070	0.080	0.90
Lender is also owner's personal banker	0.497	0.73	0.466	0.495	1.64
Owner is 45 or older	1.255	1.06	1.402	0.236	3.51
Owner is 35 or younger	2.915	1.38	4.459	0.035	18.45
High technology, R&D expenditures	−1.424	1.18	1.450	0.228	0.24
Number of loan account managers	0.744	0.37	4.049	0.044	2.11
Capacity (log(sales/loan))	2.430	0.55	19.665	0.000	11.36
Productivity (log(sales/employee))	−2.463	0.60	16.947	0.000	0.09
Years of owner experience (SQRT)	0.310	0.33	0.903	0.342	1.36
Number of employees (SQRT)	−0.857	0.26	11.032	0.001	0.42
Sole proprietorships	−0.531	1.02	0.273	0.602	0.59
Partnerships	−4.605	4.43	1.083	0.298	0.01
Home based businesses	2.054	1.09	3.537	0.060	7.80
Second digit of postal code is 0	0.741	0.91	0.665	0.415	2.10
Owned by visible minority	−0.421	1.37	0.094	0.759	0.66
Constant	26.209	88.77	0.087	0.768	

incrementality using these data was a two-stage process. In the first stage, the parameters and statistical properties of a logistic regression-based model of loan outcomes was estimated. The second stage of the analysis used the resulting model to classify a sample of CSBF loans as to whether or not the firms in the sample would have been turned down in the absence of the CSBF loan-loss-sharing program. The logic behind this approach is exemplified by the extreme case wherein if the guaranteed loans were incremental, and if the model is reliable, then the model should predict that all of the CSBF loans would be turned down. Thus, the proportion of loans that the model predicts as being turned down is, under this logic, a direct measure of incrementality.

The model was derived using a logistic regression framework, and is not unlike credit scoring procedures employed by many financial institutions. Potential explanatory variables were incorporated based on the findings of previous work and the availability of data for such measures within the survey data. The result was largely consistent with expectations. The model shows that loans have a relatively higher likelihood of being turned down if they are to firms: whose primary owner is 35 or younger; that are home-based; and that have had to deal with relatively more loan account managers. Loan applications were less likely to be declined when firms had established a longer banking relationship, when the loan was used for real assets or working capital, and for larger firms (number of employees). According to all diagnostic measures, the model appeared to be reliable: it displayed high levels of goodness-of-fit with the data and its in-sample prediction accuracy was high. These results could be considered to replicate the findings of Cowling and Mitchell (2003, pp. 70–71) who state:

> *"...the empirical evidence also shows that there are a whole host of other factors, not typically considered in theoretical models of default that have an important role to play in the determinations of small business or failure".*

We show that such variables as the purpose of the loan and the size of the firm are factors in receiving a loan. These factors, among others, were found by Cowling and Mitchell to be related to whether or not firms that received guaranteed loans failed or not.

When applied to a holdout sample of guaranteed loans that met the eligibility requirements

TABLE VI
Reduced logistic regression model of term loan outcomes

	Coefficient estimate	Standard error	Wald statistic	*p*-value	Likelihood
Purpose of loan			5.98	0.050	
Real assets	−6.161	2.59	5.5	0.017	0.00
Working capital	−6.770	2.77	5.96	0.015	0.00
Length of banking relationship	−0.065	0.05	1.79	0.181	0.94
Owner is 35 or younger	1.635	1.07	2.33	0.127	5.13
Number of loan account managers	0.602	0.32	3.561	0.061	1.83
Capacity (log(sales/loan))	2.201	0.44	25.45	0.000	9.03
Productivity (log(sales/employee))	−2.134	0.45	22.33	0.000	0.12
Number of employees (SQRT)	−0.694	0.19	13.26	0.000	0.50
Home based businesses	2.372	0.96	6.11	0.013	10.72
Constant	28.240	6.53	18.68	0.000	

of the CSBF, the model predicted that 71 of the 88 loan applications would have been turned down. After allowing for the accuracy of the model and the size of the sample, incrementality is estimated, with 95% confidence, to be within 9% of approximately 75%. The methodology used here appears to be unique among previous attempts to measure incrementality of loan loss sharing programs. The methodology could be employed in principle in any political jurisdiction that wished to evaluate its own loan guarantee scheme.

The strength of the empirical approach to measuring incrementality employed here results from the high level of reliability of the Statistics Canada data collection processes allowing this work to draw on a large national sample of borrowing experiences. Consequently, the results are generalizable both for Canadian policy as well as, potentially, for other countries whose loan guarantee programs most closely mirror that of Canada. The policy implication to be drawn from this work is that the CSBF meets one of the primary objectives defined by parliament: to facilitate the provision of debt financing for Canadian SMEs that would not otherwise qualify for business loans. The CSBF annually guarantees approximately 10,000 term loans in Canada. According to COMPAS (2002, page ii)

> *"In terms of the distribution of ... jobs [attributes to the CSBF], 15% said no new jobs had been created, while 39% had created 1–3 jobs. Seventeen percent had created six or more jobs in their firm as a direct result of the CSBFA loan. On average, companies estimated that 2.92 full-time new jobs were created as a result of the loans. The average number of part-time new jobs created was 2.2. Looked at another way, 57% of all new jobs created were full-time, while 43% were part-time".*

Given 10,000 loans per year, each of which create (according to COMPAS) 2.92 new full-time jobs and a level of incrementality of 75%, the CSBF appears to be responsible for creation of approximately 22,000 new full-time jobs in Canada each year. In addition, PriceWaterhouseCoopers (1998) compared a random sample of SBA loan recipients with a group of businesses comparable in size and industry but which did not receive SBA loans. Among their conclusions:

- recipients' employment growth was 167% versus 0% growth for non-recipients;
- employment growth was 300% compared with 37% for non-recipients;
- SBLA loan recipients tend to be younger, more aggressive businesses – start-up and growth companies – that need more capital than the average small business to finance their ambitions;
- the study also found that the program plays a strong role in financing the start-up of new businesses. About half of the loan recipients had started businesses using their SBLA-guaranteed loans.

Heretofore, it was not possible to clearly attribute these benefits to the loan guarantee program. In assessing the efficacy of government interventions, it is not only necessary to determine the extent to which benefits are incremental but also to compare the benefits to the costs, also on an incremental basis. This next step of the analysis, namely the comparison of incremental costs with incremental benefits requires internal data about the costs of honouring defaults and about potential job displacements, avenues for future study.

The primary limitation of the approach used here is that the procedure only measures one, and the most narrowly defined, aspect of incrementality. Other forms of incrementality that have been mentioned in the literature include partial incrementality, lending on more favourable terms or on a timelier basis, etc. Accordingly, further research is required to examine the existence and the prevalence of other dimensions of incrementality. In addition, further research is also needed to use different approaches to the measurement of incrementality in order to better situate the method described here.

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