A Comparative Analysis of IDB Approaches Supporting SMEs:

Assessing Results in the Brazilian Manufacturing Sector

The Office of Evaluation and Oversight (OVE) of the Inter-American Development Bank (IDB, or the Bank) conducted an impact evaluation to assess the effectiveness of the main types of programs through which IDB has supported small and medium-sized enterprises (SMEs) in Latin America and the Caribbean. It does not evaluate Bank projects directly or compare executing agencies, models of interventions or financial instruments, but rather examines the effectiveness of Bank-supported approaches implemented by Brazilian institutions. Focusing only on the manufacturing sector, the evaluation examines how these interventions affect firm-level outcomes such as employment, real wages, exports, and patent and trademark registration. The overarching objective of this exercise is to provide insight for future strategic decisions regarding the targeting of Bank support to SMEs.

The rationale for choosing Brazil is threefold: (i) Brazil represents 55% of IDB's total volume of lending supporting SMEs; (ii) country stakeholders have collected data from SMEs exposed to various types of interventions, allowing OVE to learn about alternative SME support approaches in Brazil; and (iii) OVE has access to comprehensive datasets that facilitate impact evaluations in Brazil.

OVE bases the analysis on the types of interventions the Bank has supported in Brazil, compares the results they achieved, and draws lessons for the future design and implementation of SME support strategies and budget allocation considerations.

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Office of Evaluation and Oversight (OVE)

IDB

Inter-American Development Bank
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ABBREVIATIONS

ABDI	Brazilian Agency of Industrial Development
APEX	Brazilian Trade and Investment Promotion Agency
BASA	Amazon Bank
BB	Bank of Brazil
BNB	Northeast Bank of Brazil
BNDES	Brazilian Development Bank
CEF	Federal Savings Bank
CNPJ	Brazilian Firms Identification Number
DID	Difference-in-difference
FAT	Fund for Workers' Assistance
FE	Fixed effects
FINEP	Brazilian Innovation Agency
FNDCT	National Fund for Scientific and Technological Development
IDB	Inter-American Development Bank
IFC	International Finance Corporation
INPI	National Institute of Intellectual Property
INMETRO	National Institute of Metrology, Quality and Technology
LAC	Latin America and the Caribbean
OECD	Organization for Economic Co-operation and Development
OVE	Office of Evaluation and Oversight
PROGER	Employment and Generation Income Program
PSD	Private sector development
PSM	Propensity-score matching
RAIS	Annual Social Information Report
SEBRAE	Brazilian Small Business Support Service
SECEX	Secretary for External Trade
SMEs	Small and medium-sized enterprises
UN	United Nations
UNIDO	United Nations Industrial Development Organization

The overarching objective of this exercise is to provide insight for future strategic decisions about the targeting of Bank support to SMEs.

Executive Summary

The Office of Evaluation and Oversight (OVE) of the Inter-American Development Bank (IDB, or the Bank) conducted an impact evaluation to assess the effectiveness of the main types of programs through which IDB has supported small and medium-sized enterprises (SMEs) in Latin America and the Caribbean (LAC). It does not evaluate Bank projects directly or compare executing agencies, models of interventions, or financial instruments, but rather examines the effectiveness of Bank-supported approaches implemented by Brazilian institutions. Focusing only on the manufacturing sector, the evaluation examines (i) how various SME interventions and various combinations of these interventions affect variables of interest such as employment, real wages, exports, and patent and trademark registration in Brazil; and (ii) to what extent the duration and sequencing of SME interventions influence their impact on these variables of interest. The overarching objective of this exercise is to provide insight for future strategic decisions about the targeting of Bank support to SMEs.

Institutional and market failures impede SMEs from reaching the necessary size to generate economic growth. SMEs suffer more than larger firms from inflexible regulations and standards, high registration costs and high tax rates. At the same time, weak institutions and poor coordination hinder the public sector from providing the services that SMEs need. Therefore, SMEs often turn involuntarily toward informality and operate at scales below minimum efficiency levels, underperforming in terms of average productivity, growth, and innovation compared to larger firms. Large enterprises in LAC are six times more productive than SMEs, while those in developed economies are only 1.3 to 2.4 times more productive.

Incomplete, imperfect, and asymmetric information hinders SMEs' access to financing and business consulting. Since information constraints hamper banks' risk assessment of SMEs, SMEs—particularly those investing in growth and innovation—have difficulty accessing credit. Because innovation projects are complex and lack appropriability, they are both costly and risky; thus banks require a higher premium to finance innovation activities. SMEs are less able than large firms to invest in innovation since they lack collateral and reputation and have higher risk profiles.

SME support is not immune to criticism. It is not clear that small firms use resources more productively at the margin than medium and large firms. And even if SME programs may indeed boost the productivity of beneficiary firms, some argue that in the aggregate the effects would be greater if support were open to all firms regardless of their size, particularly companies in the formal sector.

Nevertheless, a substantial share of the economic development literature suggests that well-targeted policies aimed at promoting SMEs can lead to positive development outcomes. SMEs are a fundamental part of the economic fabric in developing countries. In LAC, SMEs account for nearly 99% of firms and 67% of employment. The challenge is to continuously increase the productivity of the SME sector so that it can effectively contribute to economic development.

Several LAC countries have adopted public policies to promote SMEs through a number of development agencies. The Bank has responded with various types of interventions (9% of the IDB portfolio from 2006-2013) to address market failures that hamper the development of SMEs across the LAC region.

Brazilian institutions have historically partnered among themselves when implementing their SME support programs, and seven Brazilian agencies established partnerships with OVE to conduct an impact evaluation of their programs: Brazilian Agency of Industrial Development, Brazilian Trade and Investment Promotion Agency, Northeast Bank of Brazil, Brazilian Development Bank, Brazilian Innovation Agency, National Institute of Metrology, Quality and Technology, and Brazilian Small Business Support Service. The availability of their datasets allows for the assessment of the different types of SME support: credit, business consulting, innovation, export promotion and agglomeration.

OVE was also able to access a wide range of data on the variables of interest, including the Ministry of Labor's census of all Brazilian establishments from 2001 to 2012, which includes microdata on wages and employment; the National Institute of Intellectual Property database on patent and trademark registrations; and the Secretary of Foreign Trade's dataset on exports (showing ranges of export values). OVE adopted the threshold that is most common in the literature for the definition of SMEs (fewer than 250 employees).

Benefiting from the availability of a panel dataset with a large number of establishments, OVE adopted the fixed-effects (FE) model combined with propensity-score matching (PSM) techniques. The PSM compares treated and non-treated groups that differ only with respect to treatment but otherwise have the same observed characteristics. To help avoid selection bias, OVE verified that both treated and control establishments exhibit the same trends prior to the programs.

The analysis shows that some interventions generated positive results, but the overall findings should be read with caution. First, the overall impact ignores general equilibrium effects. Second, the assessment does not incorporate spillover effects on indirect beneficiaries of some interventions. Finally, some types of interventions are expected to produce medium and long-run effects, which could not be captured by the available timeframe of the database used by OVE.

Overall, the analysis finds that credit support is the only type of support that significantly affects all outcome variables, and it also has the most positive impact on employment and wages. The estimations suggest that establishments that received credit support experienced a 15% increase in their number of workers (3 jobs per establishment). If credit support had the same average effect and were available for all establishments, this would generate approximately 546,000 extra jobs in SMEs in the manufacturing sector alone. Participating in a credit program also resulted in a 2.4% increase in wages and significant gains in the value of exports and trademark registrations. For every 1,000 firms that received credit support, on average, nearly 2 of them registered a trademark.

The success of credit lines is related to the incentives created by program design. SMEs should use the funds not only for working capital but also to invest in goods, such as transportation equipment and computers that ultimately boost their performance.

Export support has a significantly positive impact on the value of exports and produces employment benefits. SMEs that received this support increased their number of employees by 11% on average (2.6 jobs per establishment), implying a potential for nearly 462,000 extra jobs in the manufacturing sector alone. Export promotion does not affect wages, but its impact on patents and trademarks is significant. Six additional trademarks are registered for every 1,000 establishments receiving support. Participation in an innovation program did not affect wages and employment but had a positive impact on exports.

OVE's results encourage future research regarding the "learning by exporting" hypothesis. Although no data were available to measure productivity gains, export programs were able to generate positive impacts both in exports and in patents and trademarks. Firms more exposed to external competition have incentives to innovate and to protect their innovations from competitors.

The estimations suggest that agglomeration support alone has no positive impact on outcomes for the establishments that participated in those programs. It is possible that cluster support, one of the most important activities classified by OVE under this category, was targeted to groups of entrepreneurs that could not be characterized as clusters. In this case, an intervention designed to develop clusters would be ineffective.

OVE results show that business consulting alone has a positive impact on employment, and that impact increases when combined with credit support. SMEs that received business consulting in addition to credit increased their number of employees by 16% on average (3.6 jobs per establishment).

The combination of export support and credit programs increases export more than credit alone, reinforcing the finding that export programs are well targeted. In addition, the impact of credit and export support on innovation is significant. The combination of both treatments led to an additional 12 trademarks registered for every 1,000 establishments, on average. Receiving credit before export support generates a significantly higher impact on employment than when the support is received simultaneously.

Overall, the results are positive and synergies have been found, highlighting the importance of coordination among institutions that support SME programs. This overall impact should be read with caution. Nevertheless, it is illustrative of the overall potential impact of SME support in Brazil.

The study illustrates how complex evaluations using micro data can be feasible and can address the lack of impact assessment of these programs. Yet the evaluation has limitations. Data were not available on SME revenues, loan amounts, or precise export values, which would have allowed more refined analysis of the impact of SME programs on the outcomes of interest. In addition, no information was available on the implementation costs of the programs, so an analysis of their cost-effectiveness was not possible. Finally, the evaluation focuses only on manufacturing SMEs and does not assess the extent to which various regions benefit differently from each specific intervention or a combination of support.

Follow-up studies should incorporate other SME programs and should explore other aspects of the programs analyzed. All evaluated programs are public and provided for free or on a subsidized basis. A focus on program implementation and a cost-effectiveness analysis indicate the determinants of success and would reveal the types of support that are more cost-effective.

1

Institutional and market failures prevent SMEs from reaching the necessary size to generate economic growth. SMEs suffer more than larger firms from inflexible regulations and standards, high registration costs, and high tax rates.

1 Introduction

This evaluation consists of an empirical comparative analysis of the various types of programs through which the Inter-American Development Bank (IDB, or the Bank) supports small and medium-sized enterprises (SMEs) in Latin America and the Caribbean (LAC). The evaluation focuses on interventions in Brazil and SMEs in the manufacturing sector only. It does not evaluate Bank projects directly or compare executing agencies, models of interventions or financial instruments, but rather examines the effectiveness of Bank-supported approaches implemented by Brazilian institutions. It aims to draw important lessons about the various approaches and the effectiveness of these support models.

Institutional and market failures prevent SMEs from reaching the necessary size to generate economic growth.[1] SMEs suffer more than larger firms from inflexible regulations and standards, high registration costs, and high tax rates.[2] At the same time, weak institutions and poor coordination hinder the public sector from providing the services that SMEs need[3]—for example, the shared knowledge and information that SME owners need to train employees and access business consulting,[4] and the coordination of inter-firm linkages that help integrate SMEs into supply systems and agglomerations of larger firms so that they can export products and internationalize.[5]

Therefore, SMEs often turn involuntarily toward informality and operate at scales below minimum efficiency levels, underperforming in terms of average productivity, growth, and innovation compared to larger firms. Large enterprises in LAC are six times more productive than SMEs, while those in developed economies are only 1.3 to 2.4 times more productive.[6] Inefficient operational levels generate low profitability, and SMEs then encounter further obstacles when hiring skilled workers. Moreover,

SMEs experience difficulty accessing intermediate goods and raw materials since the characteristics of the production function prevent their suppliers from scaling down their services.

Incomplete, imperfect, and asymmetric information hinders SMEs' access to financing and business consulting. Since information constraints hamper banks' risk assessment of SMEs, SMEs—particularly those investing in growth[7] and innovation—have difficulty accessing credit. Because innovation projects are complex and lack appropriability, they are both costly and risky, thus banks require a higher premium to finance innovation activities.[8] Consequently, SMEs are less able than large firms to invest in innovation, since they lack collateral and reputation and have higher risk profiles.

SME support is not immune to criticism. Many argue that small firms do not necessarily use resources more productively than medium and large firms (Lee et al., 2012). For instance, Beck et al. (2005) suggest that large enterprises are the most significant contributors to productivity growth since they are able to exploit economies of scale and more easily undertake the fixed costs associated with research and development. Also, larger firms have a lower mortality rate and provide more stable and higher-quality jobs than smaller firms, and thus may be more effective in terms of poverty alleviation. However, SME assistance programs aim not only to help small firms create more jobs per unit of investment by virtue of being more labor-intensive, but also to generate jobs for low-skilledc workers. The objective of these programs should not be just to create jobs, but rather to create productive jobs, which can occur in an enterprise of any size, including SMEs. It has been suggested that SME programs may indeed boost the productivity of beneficiary firms but, in the aggregate, the effects would be greater if support were open to all firms regardless of their size, particularly companies in the formal sector.[9]

Nevertheless, a substantial share of the economic development literature suggests that well-targeted policies aimed at promoting SMEs can lead to positive development outcomes.[10] SMEs are a fundamental part of the economic fabric in developing countries. In LAC, SMEs account for nearly 99% of firms and 67% of employment.[11] They generate employment and income for about 50% of the formal workforce in the manufacturing sector and contribute to most new jobs and revenue growth in the region.[12] In particular, export-oriented and high-tech SMEs have several spillover effects and a positive impact on job creation.[13] The challenge is to continuously increase the productivity of the SME sector to allow it to effectively contribute to economic development.

A.   BANK SUPPORT TO SMEs

Several LAC countries have adopted public policies to promote SMEs through a number of development agencies.[14] Multilateral organizations—the IDB Group, World Bank, African Development Bank, and UNIDO—have also provided extensive support for SMEs in developing countries.[15]

The Bank has ample experience supporting SME interventions in LAC countries through sovereign- and non-sovereign-guaranteed lending and technical cooperation. The IDB post-realignment portfolio (2006-2013) supporting SMEs consists of 155 sovereign- and non-sovereign-guaranteed operations amounting to US$5.7 billion, which represents nearly 9% of the IDB's portfolio and 34% of its total private sector development (PSD) lending.[16]

Support to the SME sector is stressed in various Bank strategies and guidelines. For instance, the Bank's Institutions for Growth and Social Welfare Strategy (GN-473-2) states that SME interventions aim to increase productivity. The SME Guidelines (IDB, 2009-OP-580-2) state that SMEs are important for job creation, productivity gains, and long-term growth in LAC. They indicate that the IDB's strategic support to SMEs focuses on expanding access to finance, improving the business climate, increasing formalization, and improving SME development programs and policies.[17]

The Bank has responded with various types of interventions to address market failures and support the development of SMEs across LAC. Figure 1 identifies the Bank's main approaches to support SMEs in Brazil and links the motivation for the interventions with expected outputs, outcomes, and impacts. The types of interventions in Figure 1 do not include all SME interventions supported by the IDB in LAC; the figure only considers the Bank's intervention types in Brazil and thus omits interventions aimed at addressing job training and formalization.[18]
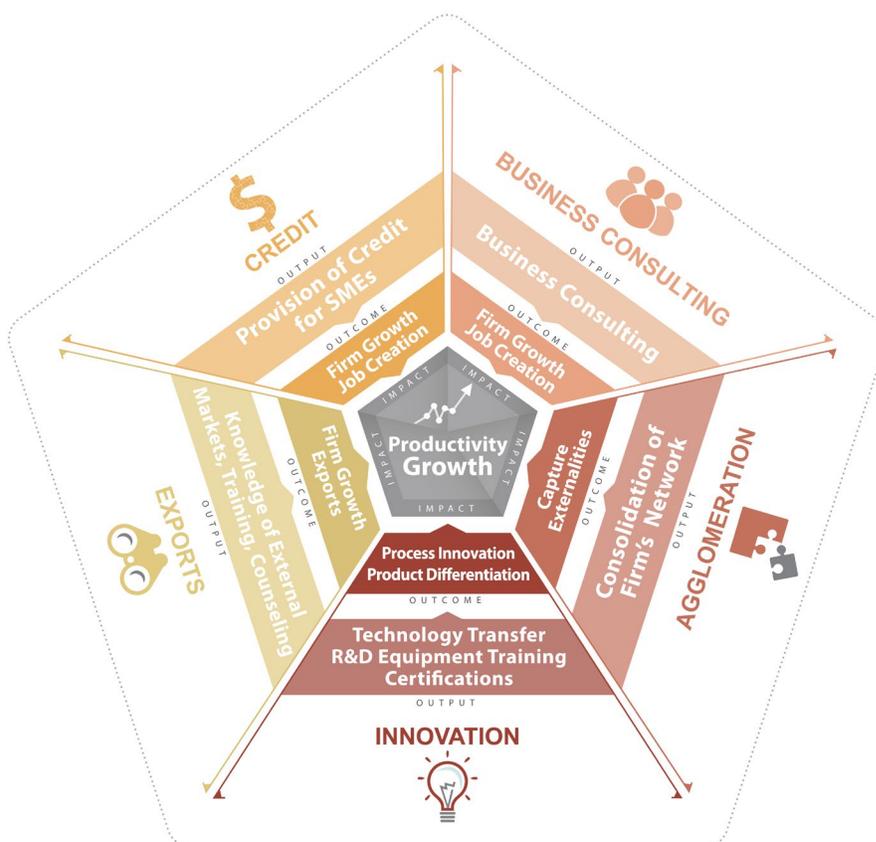
Figure 1:
IDB Approaches to SME Support

Source: OVE's elaboration.

- **Credit.** Adverse selection and moral hazard in credit markets generate financial constraints that affect SME activities.[19] Potential lenders attribute a high risk of default to SMEs—which often lack credit history, adequate collateral, and expertise to produce sophisticated financial statements—and thus deny them credit.[20] These constraints affect the SMEs' investment capacity as well as their survival throughout the business cycle.[21] Thus, a significant number of interventions have been designed to alleviate credit constraints and provide SMEs with the capital they need to reach their full potential.[22] For example, credit guarantee schemes are a risk transfer mechanism commonly used to overcome the absence of adequate collateral—they reduce the lender's credit risk by reducing the financial loss the financial institution would suffer if the SME defaults.

- **Business consulting.**[23] SMEs often lack adequate information on basic regulations, environmental management, and business management. Projects focused on business consulting are based on the idea that skills improve business performance, firm growth, and ultimately firm productivity.[24]

- **Agglomeration.** Agglomeration refers to SME support programs that are based on the idea that individual firms can benefit from productive associations with others, and they provide a localized network of specialized organizations, services, and knowledge.[25] These projects aim to overcome coordination failures that prevent SMEs from capturing such externalities.[26] The concept of agglomeration has been widely adopted as a policy tool for local economic development programs, which explains the support given by development agencies in various countries—Brazil, South Korea, Japan, France, and many others.[27]

- **Innovation.** Social returns to innovation exceed private returns implying that investors do not reap all the benefits of the investment. Asymmetry of information hampers assessment of project cost-benefit analysis, reducing the incentive to introduce innovation. Innovation projects also raise coordination problems since they depend on complementary investments such as human capital, technological infrastructure and knowledge. In turn, this knowledge is usually tacitly reached through interaction among market and non-market institutions.[28] Since innovation is the main driver of economic progress and has intangible and positive knowledge spillover effects, the role of public policy is to address market and coordination failures in order to facilitate investment in knowledge generation and to encourage innovation.[29] Policy instruments vary and include financing science and research, particularly for product differentiation and process innovation, and funding to start new businesses.[30]

- **Exports.** The programs that support export promotion are justified as interventions that correct market failures, such as information externalities,[31] and help SMEs overcome the obstacles to exporting. SMEs' lack of cross-border knowledge on

markets, suppliers, and technologies is a barrier for their access to international markets.[32] Greenaway and Kneller (2007) argue that a "learning by exporting" process for SMEs engaged in export activities leads them to innovate and be more productive. The hypothesis is that the increased competition in foreign markets may provide information to SMEs on new products and processes, thereby reducing costs and improving quality. Likewise, firms exposed to new markets can scale up their production, but they also need to be more efficient and increase their investments in innovation to tackle external competitors.

These types of interventions aim to address different market failures and are likely to produce different results in the short and medium term. While credit programs targeted at working capital may have short-term effects on growth and employment, innovation programs may take up to five years to show effects on these same outcomes, although they are expected to present short-term results in terms of investment in innovation activities (Crespi at al., 2011). Also, several interventions, such as agglomeration, exports and innovation, explicitly seek to generate positive spillover effects and produce indirect benefits to other agents that are not participating in these programs.

Table 1 shows the IDB's operations in Brazil that are aimed at supporting SMEs, breaking them down by type of approach.

B. ASSESSING THE EFFECTIVENESS OF SME SUPPORT MODELS

There have been significant challenges in extracting lessons from the initiatives implemented both worldwide and in LAC to support SMEs. First, there is no universal definition for SME (see Box 1). This analysis uses the European Union criterion for the definition of SMEs—that is, firms with at least one employee and fewer than 250 employees are considered SMEs. Second, it is difficult to analyze the impacts of each individual intervention, since interventions may be implemented simultaneously. Finally, there is little coordination among the vast number of programs for SMEs, and numerous experiences have not been assessed or had lessons extracted from them.[33]

Significant efforts have been made to evaluate the effectiveness of various individual support approaches and their spillovers, but little is known about whether and how SME-oriented interventions reinforce each other. The main objective of this evaluation is to provide rigorous evidence of impacts from different SME support models that the IDB has used.

The Bank has undertaken a range of studies assessing the effectiveness of SME support approaches. Examples of evaluated SME support approaches include access to finance (De Negri et al. 2011; Eslava et al., 2012), clusters (Garone et al., 2012), value chains (Arraiz et al., 2012), innovation (Chudnovsky et al., 2006; Crespi and Pluvia, 2010; Alvarez et al., 2011; and Castillo et al., 2013a and 2014), and export promotion (Volpe and Carballo, 2010a and 2010b; Volpe et al., 2010). In addition, recent

PROJECT NUMBER	PROJECT NAME	YEAR	AMOUNT	APPROACHES TO SME SUPPORT				
				Credit	Business Consulting	Agglomeration	Innovation	Exports
BR-L1023	Strengthening of the Entrepreneurial Activity Program Estado de Bahia (SEBRAE-BA)	2006	$10,000,000		X	X		X
BR-L1054	Financing MSMES - BNDES II	2007	$1,000,000,000	X				
BR-L1073	Banco Industrial e Comercial S.A. (Bicbanco) A/B Loan	2007	$20,000,000	X				
BR-T1058*	Cluster Support Program of the State of Parana	2007	$150,000	X		X		
BR-L1178	BNDES: Third Program under the CCLIP Line to Support MSMEs	2008	$1,000,000,000	X				
BR-L1021	Cluster Competitiveness Support Program for Minas Gerais (SEBRAE-MG)	2009	$10,000,000		X	X	X	X
BR-L1180	Program to Support Micro, Small and Medium-Sized Enterprises (BNDES)	2009	$1,000,000,000	X				
BR-T1129*	Afro-Brazilian Access to Business Credit	2009	$140,000	X				
BR-T1135*	Support Secretaria of Sao Paulo in Regional Productive Development	2009	$7,787	X			X	
BR-L1270	Mundo Vox Tenda	2010	$10,000,000	X	X			
BR-L1280	Banco Sofisa Lending Facility	2010	$25,000,000	X				
BR-T1188*	Mundo Vox Tenda	2010	$270,000	X	X			
BR-L1298	Banorte Todo Dia -The Bank of the Neighborhood	2011	$5,000,000	X	X			
BR-L1338	BIC Bank - access2services Facility	2011	$50,000,000	X				
BR-T1215*	University of the Little Market - Nurturing Micro and Small Business	2011	$365,000	X	X			
BR-X1023*	Selection and Training Program for SMEs at the Base of the Pyramid	2011	$500,000	X	X			
BR-L1366	BDMG: Innovation in Access to Finance for the Base of the Pyramid Microentrepreneurs	2013	$9,231,987	X				
			$3,140,664,774					

*Note: *Technical Cooperation/Grant*

efforts have focused on measuring the spillover effects of innovation policies through labor mobility.[34] In general, these studies have documented evidence that support to SMEs has positive impacts on employment, exports, wages and productivity. This is consistent with the results of studies conducted outside the Bank.[35]

> ### Box 1. The Classification of SMEs
>
> In the literature, the classification of SMEs varies (Ayyagari et al., 2007). The most common criterion—used, for example, by the European Union—is based on employment information. Several authors in the labor economic literature—such as Beck et al. (2005) and Moscarini and Postel-Vinay (2009)—and the World Bank classify SMEs as having fewer than 250 employees.
>
> The IDB Group has defined guidelines to classify firm size as micro, small, medium, and large (see Annex I, OP-580-2, and CII/GP-15-10). These guidelines consider different parameters for corporate and financial intermediaries' operations. For corporate, enterprise size is defined in terms of assets, revenues, and number of employees, and for financial intermediaries, enterprise size is defined by the size of operations with end-beneficiaries.
>
> OVE adopted the cut-off of 250 employees for the definition of SMEs for two reasons: (i) the possibility of validation of the results based on the literature, and (ii) the need for a narrower classification than the IDB Group, whose criteria may imply classifying all enterprises in the country as SMEs.

The previous studies focus mainly on individual support approaches and do not provide a comparative analysis of the impacts of different types of approaches within a single study.[36] Therefore, they do not provide evidence about the differential intensity and timing of relative impacts among alternative policies and examine whether the confluence of different treatments results in synergies between them.[37]

Accordingly, the Bank is working to evaluate the relative effectiveness of innovation and export promotion policies in a multitreatment setting.[38] Initial findings show positive synergies between these two types of policies. Therefore, this evaluation complements previous and ongoing work by conducting a comparative analysis of the SME approaches' impacts on outcomes of interest.

2
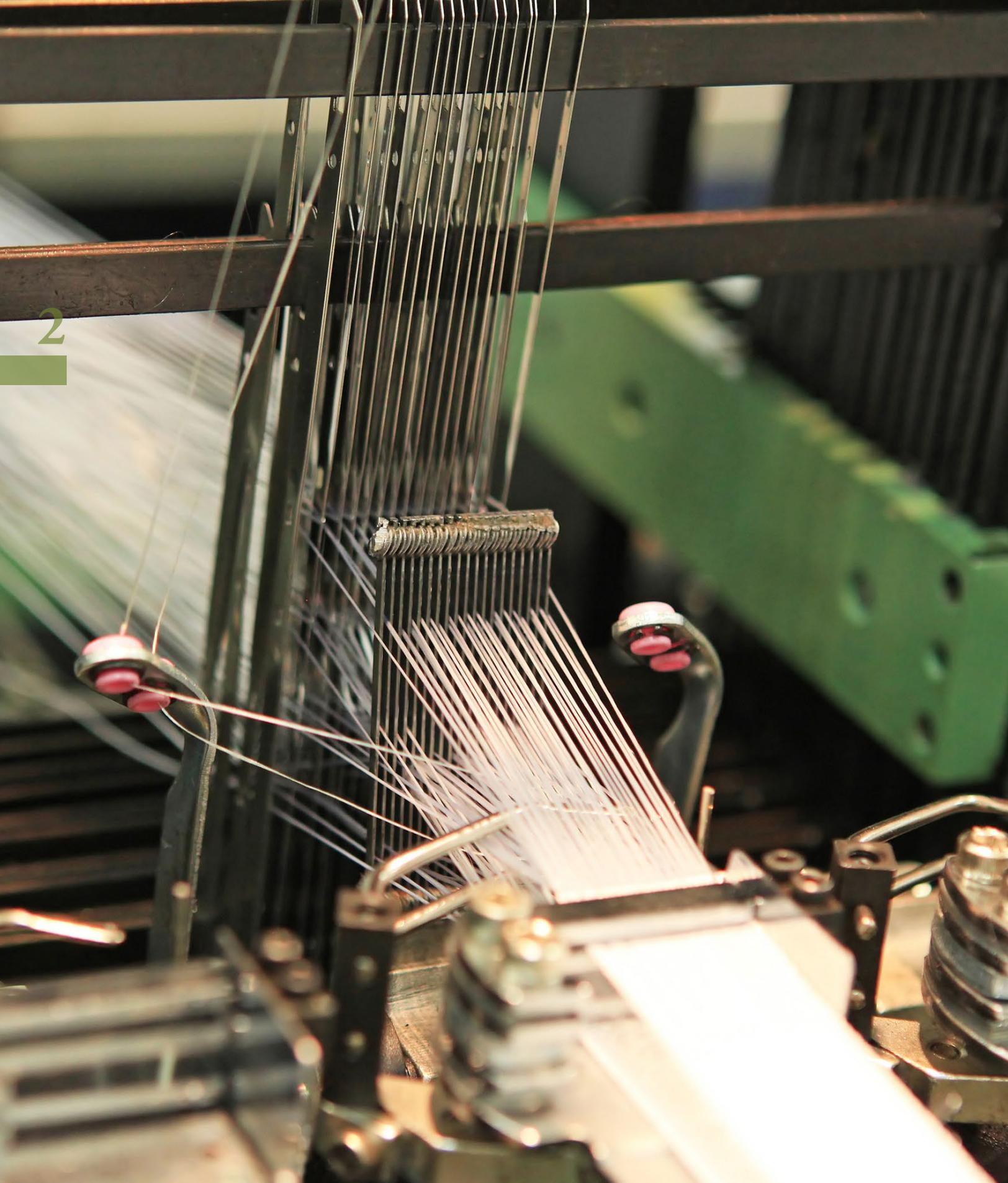
SMEs contribute up to 20% of Brazil's GDP, and more than 30% of Brazilians aged 18-64 are involved in some form of entrepreneurship.

2 Brazilian Context and SME Programs

Brazil classifies firms by size for programs to foster working capital investments, exports, and innovation efforts under special rates and conditions. As in other countries, the criteria are not applied consistently. By law, the criterion for classifying a company in a particular category is its annual turnover thresholds.[39] However, only firms classified as SMEs by the Southern Common Market (MERCOSUR) can apply for subsidized credit to foster exports. SEBRAE (Brazilian Small Business Support Service) added "number of employees" to define SMEs that are eligible to receive its support.[40] The Brazilian Development Bank (BNDES) uses annual gross income to define eligibility for its SME programs. As mentioned above, OVE uses the European Union criterion for the definition of SMEs: firms with up to 249 employees are considered SMEs.

A. THE IMPORTANCE OF SMEs FOR THE BRAZILIAN ECONOMY

SMEs contribute up to 20% of Brazil's GDP, and more than 30% of Brazilians aged 18-64 are involved in some form of entrepreneurship.[41] OVE estimates that micro, small, and medium businesses together represent 99.4% of total firms, contributing to 54% of total formal employment in the country and to nearly half (43%) of total wages in the Brazilian economy (see Figure 2).

Among the country's formal SMEs, 81% are engaged in the retail and service sector—that is, nearly 2.6 million establishments employing 25.5 million people. Agriculture accounts for 10% of the formal SMEs, with 326,045 establishments that employ 1.04 million people. Manufacturing accounts for 9% of total SMEs as well as of total Brazilian firms, with 293,686 establishments that employ 4.2 million people. The SMEs in manufacturing account for 54% of total employment in the sector.
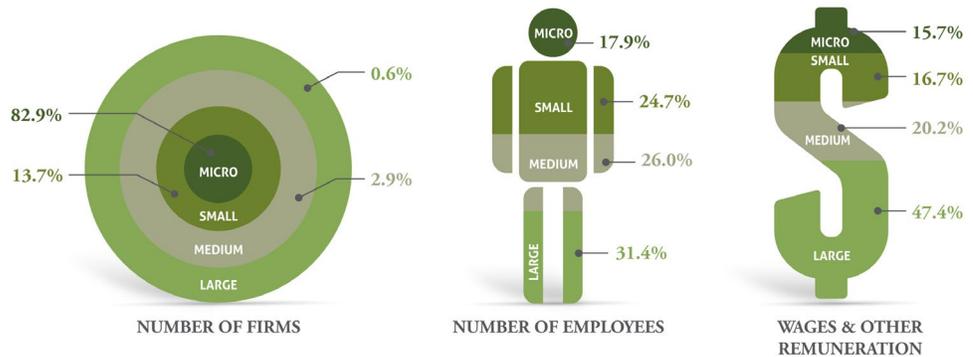
SMEs (like large corporations) are concentrated in Brazil's southeastern region (see Figure 3), which offers wider market variety, better urban infrastructure, a more qualified workforce, and a larger consumer market (43% of the country's population lives in the southeastern region).
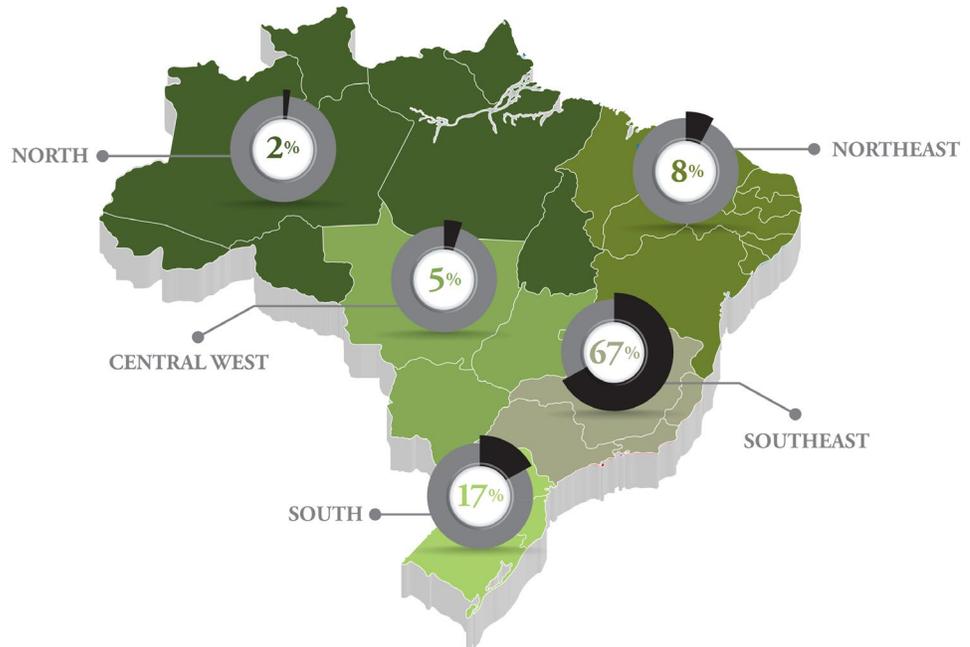
OVE's analysis only involves SMEs in the field of manufacturing.[42] Although SMEs in agriculture and retail and services represent a large share of employment, OVE decided not to include them in the analysis because the quality of the data is not as high for these sectors and the assessment would be much more time-consuming. A future analysis could assess the impact of SME programs within these sectors.

B.   The Challenges Facing Brazilian SMEs

Brazilian SMEs cope with some of the same issues that face SMEs worldwide; however, there are a few challenges that particularly hinder their impact on the economy. Although SMEs provide the vast majority of jobs nationwide, they deal with market and institutional failures that prevent them from reaching an optimal size to generate economic growth.

- **Access to Finance.** Reducing the cost of borrowing and improving SMEs' access to finance is a persistent concern in improving the competitiveness of the Brazilian economy. Credit constraints are particularly severe for SMEs, apart from the lengthy time periods associated with processing a loan (more than six months in some cases).[43] The ratio of credit to SMEs as a percentage of total credit (12.2%) is lower than the contribution from SMEs to the country's GDP (20%). Although Brazil is not far behind the LAC average (12.39%) in this area, it is merely half of the OECD average (25.54%).[44]

- **Cost of Doing Business.** Since Brazil has vast regional disparities in terms of human resources, trade logistics and capital, the cost of doing business varies across states.[45] Some states have already started to simplify procedures for registering a business, including establishing one-stop shops where multiple resources and services are offered; but in most cases, the process remains lengthy and costly. It takes 108 days to start a business in Brazil, whereas the average for the LAC region is only 36 days. SMEs also deal with cumbersome tax regimes. Even after tax simplification measures,[46] medium-sized Brazilian firms spend 2,600 hours per year filing taxes—over twice as long as the next slowest country and nearly 10 times the average.[47]

- **Trade Barriers.** Brazil ranks lower than most major countries on the quality of its hard infrastructure.[48] Logistics and bureaucracy create barriers to trade and foreign investment, causing a negative impact on the national economy, particularly on employment rates and economic growth. Brazil ranks 124 out of 189 economies worldwide in terms of trading across borders.[49]

- **Backlog in Issuance of Patents and Trademarks.** There is a backlog in patent processing and trademark registration that leads to business uncertainty and affects firms' innovation efforts. For instance, Brazilian firms take nearly twice as long as American firms to obtain their patents and trademarks from the National Institute of Intellectual Property (INPI).[50]

C. INSTITUTIONAL FRAMEWORK FOR SME SUPPORT

Implementing policies geared toward promoting SMEs is a relatively recent phenomenon in Brazil. The starting point was the approval of SME legislation in the New Constitution in 1988, although the legal framework was not implemented until 1996.[51] It established a differentiated tax regime,[52] federal funds (see Box 2) and special credit programs for SMEs. Fiscal resources were allocated to regional and national public banks, national agencies, and nonprofit organizations to fund SME support programs by financing working capital investments, exports, and innovation efforts under special rates and conditions (see Figure 4).

Box 2. Public Funds for SME Support

Fund for Workers' Assistance. The 1988 Constitution created the Fund for Workers' Assistance (FAT), whose resources come from two employer tax contributions for social security programs. FAT is linked to the Ministry of Labor and managed by a Tripartite Council comprising employees, employers, and the federal government. One important social program funded by FAT is the Employment and Income Generation Program (PROGER). PROGER is implemented in rural and urban areas and one of its goals is to support SMEs through subsidized credit. The PROGER agents are Bank of Brazil (BB) and the Federal Savings Bank (CEF), which have national coverage, and the regional development banks, Amazon Bank (BASA) and Northeast Bank of Brazil (BNB). The main public banking institutions—BNDES, BB, BNB, and CEF —partnered amongst themselves to adopt initiatives aimed at financing the working capital needs of SMEs agglomerated in value chains. As a second-tier bank, BNDES provides the resources to these banks, which in turn provide financing to SMEs in value chains.

The Constitution states that 40% of the FAT resources should be invested in BNDES for an indefinite term. BNDES absorbs the risks of the operations implemented with FAT resources and pays regular interest on them at a long-term interest rate. BNDES provides credit support to SMEs through three main programs. The first program, the BNDES Card, targets SMEs exclusively by enabling preapproved, automated credit to finance SME productive investments. The other two programs finance firms regardless of their size: The program for Machinery and Equipment Financing, known as FINAME, provides a long-term program of financing for goods and services, and BNDES Automatic finances investment projects under US$4.4 million.

Constitutional Funds. The Constitutional Funds of the Northern and Northeastern Regions, created in 1989, are major resources that BASA and BNB allocate to regional programs in the country's northern and northeastern region, respectively. The Fund for the Central-Western Region was created around the same time, and its agent is Bank of Brazil. The funds' resources mainly come from 3% of income tax and industrial products tax, and finance micro, small, and medium-sized rural and urban enterprises. The Ministry of National Integration defines the guidelines and priorities for investments and for monitoring and evaluating the programs financed by the funds.

National Fund for Scientific and Technological Development (FNDCT). Created by presidential decree in 1969 and ratified by law in 1991, FNDCT aggregates revenues from 15 sectoral funds (13 sectoral and 2 cross-sectoral funds). The FNDCT governing body, which is chaired by the Ministry of Science, Technology and Innovation, channels funds to finance firm strategies focused on innovation, regardless of their size. The Brazilian Innovation Agency (FINEP), which is the public agency responsible for managing and applying FNDCT resources, is subordinate to the Ministry of Science, Technology and Innovation and also receives resources from FAT. It addresses SME innovation efforts through subsidized and nonreimbursable programs and venture capital investments, working in partnership with institutions such as the Multilateral Investment Fund, SEBRAE, Petrobras Social Security Foundation, the National Council for Scientific and Technological Development, the Society for Promoting the Excellence of Brazilian Software, and the São Paulo Stock Exchange. FINEP also promotes SME innovation activities through the Firm Research and Technological Innovation Program, known as PAPPE, which is implemented at the state level.
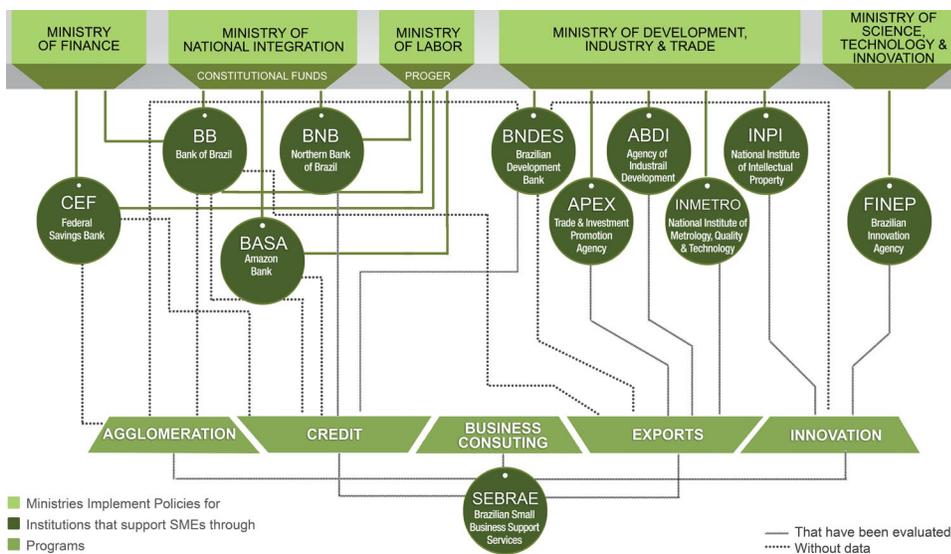
FIGURE 4:

Main Federal Support to Manufacturing SMEs

Source: OVE's elaboration

During the early 2000s, federal government policies aimed at fostering competitiveness in Brazilian industries emphasized the role of SMEs.[53] These policies envisaged a new regulatory framework and created institutions to strengthen the link between government policies and business strategies: the National Council of Industrial Development and the Brazilian Agency of Industrial Development (ABDI), which is directly subordinated to the President of the Republic, and the SME Secretariat.[54]

The Brazilian Trade and Investment Promotion Agency (APEX) was created in 2003 with the goal of promoting exports of goods and services and opening Brazilian companies to external markets. It is responsible for coordinating and implementing export promotion policies for Brazilian goods and services and for attracting foreign direct investment. APEX focuses particularly on activities that increase SMEs' exports and create jobs, although it serves companies of all sizes.[55]

Brazilian institutions historically collaborate with one another when implementing their SME support programs. For example, SEBRAE, which is the main contributor to SME support programs in Brazil,[56] collaborates with both BNDES and FINEP in venture capital and private equity funds aimed at fostering innovative start-ups, and with APEX in export promotion.

These institutions adopt measures to improve the overall business climate and to create a more propitious environment for technology development. The policies envisage eliminating taxes on investments and exports, simplifying measures to start up and close companies, and investing in INPI to simplify procedures and accelerate the registration of a patent or trademark. The National Institute of Metrology, Quality and Technology (INMETRO) offers information on the requirements and conformity assessment procedures established by foreign imports and aims to foster instruments of basic industrial technology to promote growth and technological innovation, increase competitiveness, and create a favorable environment for scientific and industrial development.

D.   CHARACTERISTICS OF THE EVALUATED PROGRAMS

Seven agencies established partnerships with OVE to conduct an impact evaluation of their programs: ABDI, APEX, BNB, BNDES, FINEP, INMETRO and SEBRAE. The availability of their datasets allows for the assessment of different types and combination of types of SME support: credit, business consulting, innovation, export promotion, and agglomeration.

1.   Credit

While BNDES and BNB provide financing, SEBRAE provides guarantees and assistance for SMEs to access financial lines. Most of the programs are demand-driven. For BNDES and SEBRAE programs, SMEs can submit their applications online.

- *BNDES Card.* BNDES Card is a preapproved line of credit that Brazilian SMEs can use to purchase locally manufactured goods, industrial inputs, and services.[57] BNDES accredits Brazilian financial institutions to issue the card. These financial institutions are responsible for the selection, credit risk analysis, and credit limit for each SME that applies for a card. Eligible SMEs should have gross annual revenues of up to US$40 million and must meet their fiscal and social obligations. Beneficiaries of the BNDES Card can only purchase products and services through suppliers registered and authorized by the BNDES and can amortize their debt through up to 48 fixed and equal monthly installments.

- *BNB lending.* As the government's primary financing agent in the country's northeastern region, BNB has been lending to micro, small, and medium-sized enterprises since it started its operations in 1954, two years after its

foundation. BNB's traditional financial services include investment solutions, such as savings accounts and certificates of deposit, as well as checking accounts, insurance products, and bill collection services.[58]

- **SEBRAE projects.** SEBRAE structures projects in which companies are advised on how to use credit from financial institutions. SEBRAE also promotes loan guarantee schemes and contributes to the funds that act as loan guarantors.

2. Business Consulting

SEBRAE offers business consulting, which is often demand-driven, to train managers, executives, and advisors of family businesses, and it helps families launch their startups. Consulting may be provided to individual SMEs or to small groups of SMEs, and is either free or subsidized by SEBRAE. It focuses on issues such as management, professionalism, and corporate governance. SEBRAE provides training through distance learning courses, its website, call center support, television programs, radio programs, technical consultancies, courses, workshops, business events, and business trips.

3. Innovation

FINEP supports innovation by providing loans and nonreimbursable financial support. It selects its beneficiaries through public calls for proposals, invitation letters, and bids. Three financial products are subject to evaluation in this report.

- **Economic Subvention.** The Economic Subvention program provides nonreimbursable financial support to share the costs and risks inherent in innovation activities. Grants have been awarded through tenders launched annually since 2006 and made available on FINEP's website.

- **Zero Interest.** The Zero Interest program, created at the end of 2005, provides interest-free loans, indexed by inflation, to SMEs with annual revenues under US$4,706,100. The program is demand-driven and is implemented through partnerships with research institutions, business associations, and industrial chambers that prequalify SMEs' proposals. FINEP provides final approval, and the program requires 20% in guarantees from SME owners.[59]

- **Reimbursable.** The Reimbursable credit line, which FINEP has been implementing since its foundation, focuses on medium and large enterprises, preferably in agglomerations, that are pursuing innovative efforts to increase competitiveness. The firms apply online. Unlike the Zero Interest program, Reimbursable requires real guarantees from firms that apply for the program.

SEBRAE develops products in areas such as certification, technology transfer programs, incubators, and product development. It provides improved access to innovation and technology through a range of services: technical consultancies, design clinics, environmental management, business incubators, science and technology parks, innovation agents, energy efficiency, certification, and Metrology Bonus.[60]

4.   Exports

APEX, SEBRAE, ABDI, and INMETRO provided data from SME beneficiaries on their export promotion programs.

- **APEX** offers support by creating export consortiums, trade promotion in international business fairs, market research, trademark development, and trade information. APEX organizes export groups that comprise approximately 15 companies each. It works in partnership with private sector associations to provide services such as market intelligence, business capacity building, trade and image promotion, and development of internationalization strategies. Trade promotion activities include participation in trade missions and international trade fairs, and visits of foreign buyers to Brazil. APEX supports export promotion by cofinancing these activities for up to 85% of the total value.

- **SEBRAE** promotes partially or fully funded activities through which firms can explore external markets: participation in export fairs, courses on how to export, and certifications that are recognized internationally and that help boost exports.

- **ABDI** was the counterpart of a technical cooperation funded by the European Union to support the international insertion of Brazilian SMEs. Implemented from 2008 to 2012, the project consisted of training activities, research, and access to high-tech equipment to promote cooperation between Brazilian and European institutions. The project was implemented in partnership with several Brazilian agencies and institutions—for example, the Foreign Trade Chamber of the Ministry of Development, Industry and Trade and regional SEBRAE offices—which selected the SME beneficiaries.

- **INMETRO's** Export Alert offers free information on technical requirements and conformity assessment procedures established by foreign importers. The information is provided upon request online.

5.   Agglomeration

SEBRAE provides general support to agglomeration stakeholders through diagnostic studies, design of action plans, specific courses, trips to business fairs and certifications. The overall goal is to reinforce and build up cooperation and governance among the public and private sectors.

3

The evaluation assesses how various SME interventions and various combinations of these interventions affect employment, real wages, exports-value range, and patent and trademark registration in Brazil.

3 Evaluation Design

The evaluation assesses the effectiveness of various types of SME interventions implemented by Brazilian institutions and supported by the Bank in the LAC region. The results are assessed for SMEs in the manufacturing sector only. The specific evaluation questions are as follows:

- How do various SME interventions and various combinations of these interventions affect employment, real wages, exports-value range, and patent and trademark registration in Brazil?

- To what extent do the duration and sequencing of SME interventions influence their impact on employment, real wages, exports-value range, and patent and trademark registration in Brazil?

A. OUTCOMES OF INTEREST AND DATA SOURCES

The main outcomes of interest are employment, real wages, exports-value range, and patent and trademark registration. Productivity is the common expected impact shared by all types of interventions, however, the available information does not allow for calculating total factor productivity. Total employment at the establishment level serves as a proxy for establishment size, allowing an analysis of whether SME support affects employment generation. OVE also assessed the effects of SME support on real wages, exports-value range and innovation.

OVE negotiated agreements with Brazilian institutions to access their datasets.

- ***Annual Social Information Report (RAIS).*** The RAIS dataset of the Ministry of Labor provides annual information about employees and establishments, including employment and wages.[61] This dataset covers all formal employment and establishments in Brazil and provides detailed information about establishments (activity, size, age, and geographic

location, from municipality to macro-region level) and employees (gender, level of education, declared hours worked, occupation, type of formal contract, nationality, admission, and redundancy data). RAIS regulates the concession of the Salary Bonus, the minimum-wage supplement program.[62] If an establishment fails to report the information required by RAIS, it faces automatic fines that are proportional to the size of its workforce and the length of the delay. Since the payment of the annual wage supplement is based exclusively on the RAIS dataset and fines are imposed for misreporting, employers and workers have strong incentives to comply with the requirements. The Ministry of Labor estimates that around 97% of all formal workers in Brazil are covered by RAIS. In 2001, RAIS comprised approximately 26 million workers and 2 million establishments, and in 2012, 47.5 million workers and 3.6 million establishments. Establishments have a unique identification number (CNPJ) that allows them to be identified across other databases used for the analysis. OVE was granted access to RAIS's microdata from 2001 to 2012. [63]

- ***Dataset of patents and trademarks.*** INPI provided a list of establishments that filed patent and/or trademark applications from 2003 onward. OVE used it to measure the effect of SME programs on innovation. Due to the backlog in patent processing and trademark registration, OVE used the "application" for patents and trademarks as a proxy for innovation.

- ***SECEX dataset.*** SECEX provided a list of establishments that export and import, which OVE used to measure the effect of SME programs on the likelihood to export. As the export data are available by value range, OVE estimates the program effects by assuming that all establishments located in a given value range export the same average value. The data also contain the establishments' CNPJs, which can be linked to RAIS and the administrative datasets of program beneficiaries described above. SECEX microdata are available from 2001 onward.[64]

B.   EVALUATION METHODOLOGY

1.   General Strategy

The evaluation uses quantitative methods to assess the impact on direct beneficiaries of the major SME support programs implemented in Brazil from 2003 to 2012.[65] The fact that the evaluation covers SMEs across the entire manufacturing sector brings external validity to the estimation. It analyzes whether establishments that received SME support—credit, agglomeration, innovation, exports, and business consulting—performed better in terms of outcomes of interest (employment, real wages, exports-value range, and patent and trademark registration) than comparable establishments that did not receive support.

Measuring the causal impacts of program participation on outcomes of interest using non-experimental data is not trivial in the context of various simultaneous treatments. The definition of causality is based on the concept of counterfactual—that is, the outcomes that would have materialized if the treated establishments had not been treated. While counterfactual causality is very intuitive, it is impossible to observe.[66]

In the absence of random assignment, an evaluation strategy should overcome selection bias by constructing a counterfactual.[67] These challenges rise since even prior to the treatment, program beneficiaries differ from nonparticipants in observable and unobservable ways. While observable factors (region, activity, size, age, and education) can be controlled for in a regression framework, the unobservable factors (entrepreneurial behavior, management skills, etc.) cannot. Yet these ex-ante differences between beneficiaries and nonparticipants can explain their participation or non-participation in the program. Also, the time-series dimension of the panel data creates correlation between periods and can affect the independence of the establishment's variables over time, thus biasing the estimation coefficients. For instance, the fact that one establishment participated in the program in the past may affect the probability that other establishments will receive the same or another treatment.

Benefiting from the availability of a panel dataset with a large number of establishments, OVE adopted the fixed-effects (FE) model combined with propensity-score matching (PSM) techniques.[68] The aim was to guarantee that the estimations compare control and treated groups that are similar enough to mitigate omitted variable bias—that is, a bias arising from unobserved and uncontrolled differences between these two groups (see Annex III for the model specification).

The FE model provides a means of controlling for omitted variable bias. In an FE model, the assumption is that establishments may have individual unobserved characteristics (omitted variables) that may be time-invariant or "fixed." For instance, individual establishments' business practices or cultural factors have the same effects on outcomes, such as real wages or employment, over time.[69]

The assumptions behind the FE model are more credible when treated and control establishments exhibit the same time trends before the programs, and the establishments are more similar in these two groups.[70] OVE analyzed the trends in four outcomes (employment, real wage, exports-value range, and patent and trademark registration) before the start of the interventions between treatment and control groups to provide evidence that differences between them are statistically indistinguishable from zero.

OVE applied the PSM technique to construct a control group.[71] The PSM computes treated and non-treated groups that differ only with respect to treatment but otherwise have the same observed characteristics. PSM defines the probability of each establishment's participation in the evaluated programs given a set of explanatory variables (age, education, and activity) before the treatment.[72] RAIS does not provide a

rich array of variables to use in the PSM. Given data constraints, OVE tested different PSM, consistently including age and education in the specification and altering the use of geographical and sector dummies.[73]

OVE constructed three alternative control groups as a match for the treated establishments to provide robustness checks to the estimations.[74] First, the control group comprised all the untreated establishments. Second, OVE restricted the control group to firms in the region of common support.[75] Finally, OVE constructed a control group by using the nearest neighbor matching technique to constrain the sample and stratification regression for matching.[76]

OVE matched treated and non-treated units using a propensity score for each unit that ranges from zero (no probability of participation) to unity (high probability of participation). Then, OVE divided the establishments into blocks according to the stratification of the propensity score at the year 2001 and ran the FE model using these blocks as controls.[77]

The large size of the database allowed OVE to address the problem of attrition rate bias (loss of participants).[78] The main issue is that attrition is likely to depend on characteristics such as education and age, biasing the panel data estimations. In this particular database, the shrinkage in the number of establishments along the panel may not only be the result of a downward bias (increase in the SME death rate) but also of an upward bias (reclassification of the SMEs that exceeded the upper threshold of the SME definition). To provide results that are not affected by these effects, OVE only tracked the establishments that appear along the entire panel period, between 2001 and 2012. The resulting loss of observations does not affect the robustness of the results or the representativeness of the sample. OVE tested this by comparing the means of both balanced and unbalanced samples using simple t-tests.[79] The difference between balanced and unbalanced panels is that in the former, all establishments are observed across all years. The tests show that balanced and unbalanced panels are similar for wage and employment while they are significantly unequal for exports-value and patent and trademark registration outcomes.[80]

The evaluation results are an average for the whole country. Every model was run controlling for the geographical location of the establishment—that is, dummies were used for the 26 states and the federal district. However, the evaluation design does not rule out the possibility of differences in impact due to establishment location. Thus, a future analysis could assess the extent to which various regions benefit differently from individual interventions or a combination of support. A distribution of the establishments covered by the evaluation sample shows that 75% of them are concentrated on the southern and southeastern regions of the country.

OVE conducted two additional robustness tests. First, OVE built propensity scores using 2002 as a baseline (instead of 2001) while including the lagged values of real wages and effective employment (2001 values) as inputs. To assess the impact of the

programs, the variation in the outcomes should not take place before the firms are treated; therefore, OVE controlled for pre-treatment trends in the outcomes. As long as the results are similar with or without lagged outcomes in the PSM, the hypothesis of similar trends between control and treatment groups cannot be rejected.[81] In addition, as a second exercise, OVE tested the sensibility of the results when only smaller firms (fewer than 51 employees) and larger firms (more than 50 employees and fewer than 250) are considered. See Annex VIII for a presentation of the results of both robustness estimations.

2.   Summary Statistics of Treated and Control Groups

As mentioned above, OVE constructed three alternative control groups to provide robustness checks to the estimations, using 2001 as the baseline. Table 2 shows the characteristics of the treated group with the three alternative control groups—universe of non-treated, common support, and neighbor—for all treatments. In general, the treated establishments have more employees than the control groups, while they are even in terms of the average age and education of their employees. For the sake of illustration, this section presents the credit treatment only.

First, the control group comprised all the untreated establishments ("non-treated group" in the second column). For instance, the average monthly wage in establishments exposed to credit treatment was US$165.96 as opposed to an average monthly wage of US$187.23 in the group of establishments that did not receive credit support. This comparison is provided for outcome and explanatory variables across all types of interventions.

Second, OVE restricted the counterfactual group to the common support group—that is, only the establishments that are in the range within the overlap of the distribution of the propensity score for the treatment and control group ("region of common-support" in the third column). This procedure eliminates from the sample non-treated establishments that have very different probabilities of being treated, comparing only treated and non-treated establishments with more similar probabilities of being treated. The table shows that the common support group has almost the same observations (29,426 instead of 29,429) and is overall very similar to the full untreated set of establishments.[82]

Finally, OVE restricted the common support group by using nearest neighbor matching ("nearest neighbor group" in the fourth column).[83] For the establishments that received credit, the average wage of the nearest neighbor control group (US$169.05) is the most similar to the value of treated establishments (US$165.96).

Table 2 shows that while the control groups appear to be similar in the covariates age and education and in the outcome wages, the nearest neighbor group comprises establishments that are smaller on average in terms of number of employees.[84]

Alternative PSM exercises were performed, and the estimations based on alternative control groups provide similar qualitative results. Nevertheless, the database does not have many alternative variables to be used in the PSM.[85]

TABLE 2. FIRM CHARACTERISTICS FOR TREATED AND CONTROL GROUPS (2001)

	Treated group	Non-treated group	Region of common support	Nearest neighbor group
Credit treatment				
Employment	16.70244	16.05611**	16.05769**	10.44568***
Wages	370.2738	417.7371***	417.7471***	377.1979
Average years of schooling	7.379897	7.218393***	7.218586***	7.469587***
Average age	30.42501	31.64098***	31.63978***	30.31922
Export range	0.106565	0.096096*	0.096106*	0.057128***
Patents & trademarks	0.00188	0.001393	0.001393	0.001116
Observations	6916	29429	29426	9855
Agglomeration treatment				
Employment	20.92902	16.05611***	16.10159***	8.75264***
Wages	358.1679	417.7371***	406.4216***	341.4263
Average years of schooling	6.619537	7.218393***	7.187844***	7.368907***
Average age	31.23284	31.64098**	31.59286*	30.19931***
Export range	0.089209	0.096096	0.095504	0.051067**
Patents & trademarks	0.001439	0.001393	0.001372	0
Observations	695	29429	29161	1547
Export treatment				
Employment	28.54677	16.05611***	16.12223***	7.77509***
Wages	469.7073	417.7371***	417.005***	379.1525***
Average years of schooling	7.608477	7.218393***	7.2396***	7.898422***
Average age	31.66321	31.64098	31.63734	30.18283***
Export range	0.4211618	0.0960957***	0.0966342***	0.0515371***
Patents & trademarks	0.0082988	0.0013932**	0.001401**	0.0013562**
Observations	964	29429	29265	2212
Innovation treatment				
Employment	30.79773	16.05611**	16.15079***	7.399535***
Wages	650.8791	417.7371***	418.5299***	409.3457***
Average years of schooling	9.195464	7.218393***	7.270086***	8.943388
Average age	30.9484	31.64098	31.58663	27.86481***
Export range	0.3398058	0.0960957***	0.0966094***	0.087108***
Patents & trademarks	0.038835	0.0013932*	0.0014056*	0.0034843*
Observations	103	29429	29169	287

Business consulting treatment				
	Treated group	**Non-treated group**	**Region of common support**	**Nearest neighbor group**
Employment	20.32947	16.05611***	16.14668**	7.5009***
Wages	334.8684	417.7371***	418.1541***	358.9682
Average years of schooling	7.226045	7.218393	7.219202	7.74047***
Average age	31.52295	31.64098	31.60226	29.90064***
Export range	0.1134021	0.0960957	0.0965845	0.023753**
Patents & trademarks	0.0051546	0.0013932	0.0014018	0.0
Observations	194	29429	29429	421

Note: *, **, and *** indicate that the difference in means test is statistically significant (using the treated group as a benchmark) at the 10, 5 and 1% levels respectively.
Source: OVE's elaboration

Annex IV shows the similarities in trends and distributions between treated and control groups. The Kernel Density Charts display the pretreatment performance trends prior to 2003. As mentioned above, the specification strategy only demands parallel preexisting trends, relaxing the assumption of similarity in levels between control and treatment groups as described in Table 2.[86] As long as the "before-treatment" trends in outcomes are parallel and the unobservable factors explaining differences between control and treated establishments are time-invariant, the FE model consistently captures the impact of SME support. OVE complemented this graphical analysis by testing the significance of "anticipatory" effects and by adding a pre-treatment control specification. For all the cases, the estimates of anticipatory effect are either negative or non-significantly different from zero.

3. Combination of Treatments

OVE conducted an impact assessment of four combinations of programs, taking credit as a reference and adding each of the other programs: credit plus agglomeration, innovation, exports value, and business consulting. Positive correlations between support combinations and outcomes would reveal that although credit support may help establishments conduct daily operations by providing working capital, only additional support such as agglomeration, innovation and exports-value may boost productivity.

OVE applied the same estimation technique used for single treatments. The only difference was that OVE selected the establishments that received credit as a control group. Then, OVE compared those establishments that received a combination (treated group) with the control group.

OVE provides further evidence on whether the sequencing of different interventions has implications on SME performance. In particular, the evaluation assesses whether credit and each of the other treatments show differential effects depending on their sequential order. In this case, OVE compared establishments that received both sequences of treatments (credit before other or other before credit) corresponding to the same combination with a control group comprising establishments that received only credit. Comparing coefficients can provide information on the significance and differences of the sequences.

Credit programs did particularly well: it is the only type of support that significantly affects all outcome variables. Export support is well targeted, since this type of intervention has a significantly positive impact on exports-value range.

4 Results

A.   EMPIRICAL RESULTS

1.   Single Treatment Impacts

Table 3 reports the estimates of the impacts of each type of intervention on the four outcomes of interest.[87]

TABLE 3. IMPACT OF SME SUPPORT ON EMPLOYMENT, WAGES, EXPORTS-VALUE RANGE, AND PATENTS AND TRADEMARKS (2001 BASELINE; NEAREST NEIGHBOR SAMPLE)

	Employment (1)	Log wages (2)	Exports-value (3)	Patents and trademarks (4)
Credit	3.018***	0.0142***	0.0112***	0.00174***
	(11.64)	(5.63)	(2.99)	(2.84)
	162024	161674	162024	162024
Agglomeration	1.419**	-0.00745	-0.0108	0.00218
	(2.39)	(-1.12)	(-1.36)	(1.56)
	17352	17300	17352	17352
Export	2.578***	-0.00279	0.0448***	0.00591**
	(4.17)	(-0.47)	(3.14)	(2.09)
	24684	24632	24684	24684
Innovation	0.166	0.0158	0.0854**	0.0138
	(0.08)	(0.61)	(2.19)	(0.98)
	2640	2640	2640	2640
Consulting	3.652**	-0.00425	0.0106	0.00111
	(2.06)	(-0.43)	(0.55)	(0.64)
	5064	5037	5064	5064

Notes: (a) ***, **, and * denote statistical significance at the 1, 5, and 10 percent level. (b) Estimations control for the stratification of the groups. (c) The italicized values refer to the number of observations used in the respective regression.

Source: OVE's elaboration.

Credit support: higher positive impacts. Overall, credit support has the most significant positive impact on employment and wages. It thus has significant potential to affect social outcomes through employment generation. The estimations suggest that

establishments that received credit support experienced a 13% increase in their number of workers (3.0 jobs per establishment).[88] SMEs in manufacturing generate employment for 4.2 million workers. If credit support has the same average effect and is available for all establishments, then this implies a generation of approximately 546,000 extra jobs in SMEs in the manufacturing sector alone. Participating in a credit program also resulted in a 1.4% increase in wages and significant gains in exports-value range[89] and trademark registration. For every 1,000 firms that received credit support, on average, nearly 2 of them registered a trademark.

Exports: well-targeted support. Export support is well targeted, since this type of intervention has a significantly positive impact on exports-value range. Export promotion also produces benefits for employment: SMEs that received this support increased their number of employees by 11% on average (2.6 jobs per establishment). This would also imply a generation of nearly 462,000 extra jobs in the manufacturing sector alone. Export promotion does not affect wages, but its impact on patents and trademarks is significant, since six additional trademarks are registered for every 1,000 establishments that receive support.

Innovation support: positive impact on exports. On average, participation in an innovation program did not lead to the registration of additional trademarks and did not affect wages or employment, but it had a positive impact on exports-value range.

Business consulting: positive impact on employment generation. The estimations suggest that business consulting support alone has a positive impact on employment. The establishments that received business consulting support experienced nearly a 16% increase in their number of workers (3.6 jobs per establishment). The result is statistically significant only at the 5% level but it is robust when using alternatively the nearest neighbor matching estimation with 2002 as the baseline (see Table A.VIII.1 in Annex VIII).

Agglomeration: no robust impact. The estimations suggest that agglomeration support alone has a positive impact on employment. Nevertheless, this impact is small compared to the effect of credit, export and consulting services on employment and is statistically significant only at the 5% level. Furthermore, robustness tests based on alternative estimations presented in the Annexes V and VIII indicate that the positive impact of agglomeration support on employment is not a robust result.[90] In addition, there is no indication of a positive impact on wages, patents and trademarks, or exports value for the establishments that participated in this program.

2.   Impacts from Combinations of Treatments

This section analyzes whether the combination of credit and another type of support produces an additional impact on the outcome variables if compared with the impact already produced by credit support alone. Table 4 presents the

estimations of the *additional* impact on outcome measures due to the provision of credit in combination with another type of SME support.[91] As the comparison group comprises establishments that already received credit support, the coefficients reflect the impacts *additional to credit*, and they are also able to capture the synergies or combination-effects against isolated treatments.

Table 4. Combination of Treatments: Impact of Credit Support in Combination with Other Treatments (2001 Baseline; Nearest Neighbor Sample)

	Employment (1)	Log wages (2)	Exports-value (3)	Patents and trademarks (4)
Agglomeration	1.613	0.00325	-0.00590	0.00295
	(1.05)	(0.31)	(-0.30)	(0.72)
	6552	6546	6552	6552
Export	1.889	0.00402	0.0786***	0.0119*
	(1.61)	(0.50)	(3.69)	(1.94)
	10728	10721	10728	10728
Innovation	6.385	0.00500	0.0615	-0.0123
	(1.55)	(0.20)	(0.64)	(-0.51)
	1164	1161	1164	1164
Consulting	3.740**	-0.00760	-0.0287	-0.00224
	(2.42)	(-0.45)	(-0.96)	(-1.43)
	2496	2496	2496	2496

Notes: (a) ***, **, and * denote statistical significance at the 1, 5, and 10 percent level. (b) Estimations control for the stratification of the groups. (c) The italicized values refer to the number of observations used in the respective regression.

Source: OVE's elaboration.

a. Synergies: Credit with Exports and Business Consulting

The combination of export support and credit programs provides an increase in export value in addition to credit alone, strengthening the idea that export programs are well targeted. In addition, the impact of credit and export support on innovation is significant. The combination of both treatments led to the registration of an additional 12 trademarks for every 1000 establishments on average.

Establishments that sought business consulting and that also participated in a credit program experienced a greater increase in employment than comparable ones that received only credit. As the coefficient in Table 4 shows, when combined with credit support, business consulting not only promotes employment but also almost doubles the individual impact of credit. SMEs that received business support in addition to credit increased their number of employees by 16% on average (3.7 jobs per establishment).

b. No Synergies: Credit with Agglomeration and Innovation

Establishments that received agglomeration support in addition to credit did not perform better than those that received only credit. Although credit support affects all outcome variables and agglomeration support affects employment, the combination of these two programs does not provide additional-to-credit impact on the outcome variables.[92]

It has been shown that innovation and credit support alone each led to an average increase in exports. However, the results suggest that the combination of these interventions does not result in an additional positive effect on exports when compared with the effect of credit support alone. These results imply that the hypothesis of lack of synergies between credit and agglomeration and credit and innovation support cannot be rejected.

3. Duration of the Program Effect Impacts

The treatment effect estimations indicate whether a type of intervention affects outcome variables but do not shed light on the elapsed time after which the treatments lead to the highest level value in outcomes. Thus, OVE also estimated the duration of the programs' effects (Table 5).

TABLE 5. DURATION OF PROGRAM SUPPORT EFFECTS (2001 BASELINE; NEAREST NEIGHBOR SAMPLE)

	Employment (1)	Log wages (2)	Exports-value (3)	Patents and trademarks (4)
Single treatment				
Credit	14.93	9.11	23.34	-10.39
Agglomeration	5.03	1.99	2.98	7.67
Export	2.04**	-0.55*	3.46**	11.21
Innovation	1.54	1.39	6.23	-3.30
Consulting	2.90	1.01	0.87**	-3.47
Credit plus other treatment				
Credit+Agglomeration	-1.00*	0.81	1.02	-1.77
Credit+Export	1.12**	0.52*	11.30	3.97*
Credit+Innovation	3.09	-2.68	1.26	144.35
Credit+Consulting	-2.57	5.14	-3.16	-14.64

Notes: (a) The quotients shown in the table were obtained by the expression shown in footnote 94 and explained in Annex III. (b) These quotients can be read as "number of years" only when the coefficient of interaction γ of the FE specification is significant and negative. (c) * denotes the presence of significant and positive coefficient of interaction γ. (d) ** denotes the presence of significant and negative coefficient of interaction γ.

Source: OVE's elaboration.

The coefficient of interaction between years and treatments allows for the estimation of the number of years that the treatment impact reaches the highest outcome values. For cases in which there is a negative interaction coefficient, the treatment impact

reaches its highest outcome values after a number of years following the treatment.[95] The cases in Table 5 that are non-significant coefficients do not provide any useful information.

The results show that for export support alone, the highest level on employment and exports-value range is observed 2.04 and 3.46 years after the first treatment, respectively; when combined with credit, export support's effect on wages peaks 0.52 years after the treatment.

4.   Sequencing Effect Impacts

The panel data constructed for the evaluation allow OVE to further contribute to policymaking by providing evidence on whether the sequencing of the combination with credit analyzed in the previous section matters. Table 6 shows the impacts for the sequences of a credit intervention followed by other treatments.

TABLE 6. SEQUENCE OF TREATMENTS: IMPACT OF RECEIVING CREDIT SUPPORT FIRST FOLLOWED BY OTHER SUPPORT (2001 BASELINE; NEAREST NEIGHBOR SAMPLE)

	Employment (1)	Log wages (2)	Exports-value (3)	Patents and trademarks (4)
Agglomeration	-3.633	0.0278	-0.00960	0.0226
	(-0.88)	(1.02)	(-0.15)	(0.85)
	684	683	684	684
Export	3.366***	0.00134	0.0820***	0.0112*
	(2.71)	(0.17)	(3.54)	(1.70)
	10654	10654	10654	10654
Innovation	5.938	0.00895	0.0104	-0.0266
	(0.67)	(0.27)	(0.08)	(-0.90)
	594	594	594	594
Consulting	4.032**	-0.00815	-0.0280	-0.00239
	(2.50)	(-0.46)	(-0.87)	(-1.43)
	2485	2485	2485	2485

Notes: (a) ***, **, and * denote statistical significance at the 1, 5, and 10 percent level. (b) Estimations control for the stratification of the groups. (c) The italicized values refer to the number of observations used in the respective regression.

Source: OVE's elaboration.

In the panel data used in the regressions, there are no observations of firms that received export and consulting treatments before receiving credit. The regression of other treatments followed by credit did not show any significant result (see Annex X).

For agglomeration and innovation, the sequence of credit followed by these treatments had no impact on outcome variables when compared with credit treatment alone, regardless of the sequence of the combination. Credit and consulting services

are always simultaneous or preceded by credit, and results are similar to Table 4. However, receiving credit prior to export support (Table 6) generates a higher significant impact on employment than when both types of support are received simultaneously (Table 4).

B.   Discussion of Results

The analysis shows that some interventions generated positive results, but the overall findings should be read with caution. First, the overall impact ignores general equilibrium effects. Second, the assessment does not incorporate spillover effects on indirect beneficiaries of some interventions. Finally, some types of interventions are expected to produce medium and long-run effects, which could not be captured by the available timeframe of the database used by OVE.

Credit programs did particularly well: it is the only type of support that significantly affects all outcome variables. Furthermore, the combination of credit and business consulting or exports has an additional positive effect on employment and export, respectively.

The positive impacts of SME credit programs on employment are aligned with the findings of other empirical studies in Brazil and worldwide. De Negri et al. (2011) found that SME access to Brazilian public credit lines has a significant and robust positive impact on employment, although they did not find evidence of a significant effect on productivity (real wages as a proxy). More specifically, Machado et al. (2012) also found positive impacts on employment from the use of the BNDES Card by micro and small enterprises in Brazil. These impacts are confirmed by studies focused on SME programs worldwide. Eslava (2012) found that beneficiaries of Colombian Foreign Trade Bank Bancoldex credit resources had achieved over 19% and 22% growth in employment and productivity. Brown and Earle (2013) showed a 25% (3 jobs on average) positive effect of the U.S Small Business Administration Services loans on employment.

The literature and the results of this evaluation show that credit lines are an effective tool for promoting employment generation and increasing wages among SMEs. The success of credit lines could be related to the incentives the program design creates. SMEs should use the funds not only for working capital but also to invest in goods, such as transportation equipment and computers that ultimately boost their performance. Thus, appropriately designed credit support emerges as an attractive policymaking tool to increase employment and wages in SMEs.[96]

The Brazilian credit program incentives have also been effective in improving SMEs' performance on other outcomes, such as exports and innovation. The results suggesting that credit is also an effective tool to increase exports is in line with De Negri et al. (2011) and with Molina and Roa (2014) that show the positive effect

of public credit lines on exports in Brazil and Colombia, respectively. Molina and Roa (2014) argue that the availability of external financing for the firms' operational variable costs plays a central role in determining a manufacturer's decision to enter into exporting. Credit programs also performed well regarding innovation. Credit thus emerges as a policy tool to increase exports to the extent that firms can allocate the necessary extra resources to innovative activities and explore new markets.

Greenaway and Kneller (2007) argue that firms exposed to new markets can scale up their production but also need to be more efficient and increase their investments in innovation to tackle external competitors. The positive result of credit support on exports might thus be related to investments necessary to compete with external competitors in global markets.

The results of previous empirical studies are mixed regarding the validation of the "learning by exporting" assumption.[97] For instance, Ortega et al (2013) did not find results to support the "innovating by exporting" hypothesis but found that Chilean firms that invest more in research and development tend to become exporters. However, Crespi and Zuñiga (2010) found that apart from export efforts, cooperation has also played an important role as one of the determinants of innovation in Latin American countries.

OVE results encourage future research regarding the "learning by exporting" hypothesis. Although there are no data available to measure productivity gains, export programs were able to bring positive impacts both in export-value range and patent and trademark outcomes. Firms more exposed to competitive markets should not only innovate but also protect their innovations from these competitors.

The characteristics of export promotion programs reinforce the findings of Crespi and Zuniga (2010) that cooperation also boosts exports. The fact that the programs evaluated by OVE involve articulation among SMEs to organize fairs and road shows abroad to promote their products and learn about export opportunities can help explain the success of these programs. OVE results suggest that export promotion support may be important to provide establishments with opportunities to start selling and learning by conducting business with foreign markets. Interestingly, OVE's results show that support focused on export promotion increases its power to leverage export-value range and patent and trademark registration when it is combined with credit support.

Another important finding is that innovation support has no positive impact, either alone or when combined with credit, on a firm's trademark and patent registration, but it does affect exports. These results suggest that innovation support might be related to product and process innovation, which allows SMEs to export. Blyde et al. (2014) found that both export and innovation promotion in Chile favorably impact firms' exports and also identified evidence that the programs are complementary.
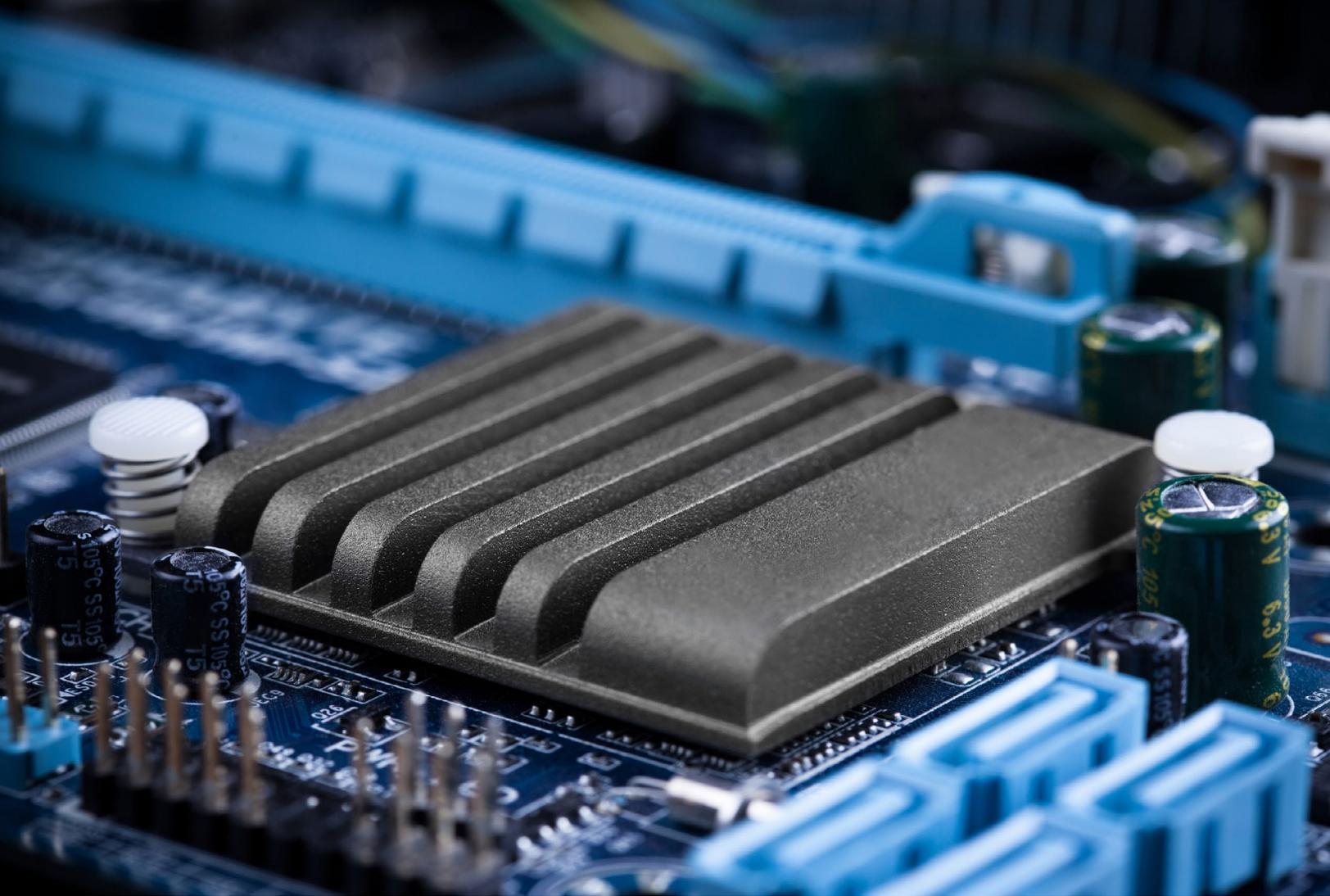
Business consulting presents positive results on employment when provided alone. However, when combined with credit support, it leads to a significantly positive long-term impact, even higher than credit support alone.

The finding that innovation support does not necessarily translate into trademarks and patents should be read with caution. As analyzed in the context section, innovation programs are expected to produce short, medium and long-run effects, which reflect the different stages of their intervention model. The available timeframe of the dataset could not allow the capture of potential impacts on the issuance of patents and trademarks.[98]

Another striking result is that while business consulting presents positive results on employment when provided alone, when combined with credit support, it leads to a significantly positive long-term impact, even higher than credit support alone although with a lower significance level (5%).[99] Firms that received business consulting had the lowest average wage among all other treatments, an indication that these firms do not have adequate managerial skills. This may be an indication that firms seeking these services aim to boost their productivity by improving their management, processes, and practices. Nevertheless, to improve these aspects, new investments may be necessary, and credit becomes necessary to make business consulting work. Another possible explanation of the synergy between credit and business consulting programs could be related to the intrinsic nature of business consulting itself. For instance, the value added from accountability or healthy finance workshops could be larger for those firms with access to formal credit.

On the downside, OVE found that agglomeration services do not lead to any positive impact on outcome variables except for a non-robust significantly positive impact on employment. These results apparently contrast with Garone et al. (2012), who found that firm-level performance (employment and exports) benefits from cluster policies.[100] There are three important remarks. First, Garone et al. focused this evaluation on a limited number of cluster programs in Brazil (in the states of São Paulo and Minas Gerais), while OVE included all programs implemented nationwide. Second, as explained before, OVE estimated the impacts of activities aimed at supporting agglomeration economies, such as value chain, cluster, and local productive systems in Brazil. Lastly, one possible explanation for the lack of average effect of agglomeration support may derive from the fact that cluster support, which is one of the most important activities classified by OVE under this category, may have been provided for groups of entrepreneurs in economies that cannot be characterized as clusters—and thus an intervention designed to develop clusters would be ineffective.[101]

The evaluation findings suggest synergistic gains from the combination of SME programs. Credit boosts the effect of export promotion on export-value range and trademark registration. In turn, business consulting boosts and sustains the effect of credit on employment.

Although the data used in the evaluation do not contain information to provide a cost-effectiveness analysis, the evaluation indirectly allows policymakers to think about the cost-effectiveness of credit interventions. Credit programs are always reimbursable, even though credit is subsidized. Thus, the results might well be in line with the suggestion of Brown and Earle (2014) that the provision of subsidized credit may be a relatively low-cost way to generate employment.

5

The results are positive and synergies have been found, highlighting the importance of coordination among institutions that support SME programs.

5 Final Remarks

This evaluation uses nationwide data to examine various SME programs in Brazil. Overall, the results are positive and synergies have been found, highlighting the importance of coordination among institutions that support SME programs. This overall impact ignores general equilibrium effects and should be read with caution. Nevertheless, it is illustrative of the overall potential impact of SME support in Brazil.

This study illustrates how complex evaluations using microdata can be feasible and can address the lack of impact assessment of these programs. Nevertheless, the evaluation has limitations. Data were not available on SME revenues, loan amounts, or precise export values, which would have allowed a more refined analysis of the impact of SME programs on the outcomes of interest. In addition, information was not available on the implementation costs of the programs, so an analysis of their cost-effectiveness was not possible. Finally, the evaluation only focused on manufacturing SMEs and did not assess the extent to which various regions benefit differently from each specific intervention or a combination of support.

Follow-up studies should incorporate other SME programs and should explore other aspects of the program analyzed. All evaluated programs are public and provided for free or a subsidized basis. A focus on program implementation and a cost-effectiveness analysis would indicate the determinants of success and reveal the types of support that are more cost-effective.

1   Cravo et al., 2010; Beck and Demirguc-Kunt, 2006; Beck et al., 2005.

2   Aterido et al., 2009.

3   Rodriguez-Clare, 2005.

4   Ibarrarán et al., 2008.

5   OECD, 2008, 2009.

6   OECD and ECLAC, 2013.

7   See Beck and Demirguc-Kunt, 2006; and Lage de Sousa, 2012.

8   Innovation projects are complex because it is difficult to obtain accurate information on their potential markets, technology and production possibilities, hampering the assessment of their benefits. Since these projects may have spillovers on other competitors due to their lack of appropriability, innovators are reluctant to share information that bankers need to assess their risks. Appropriability refers to the different ways an economic agent may profit from its inventions or innovations by temporarily enjoying some type of monopolistic power over the knowledge it creates. The problem is related to the semi-public-good characteristics of knowledge, for which exclusion is feasible but rarely or never perfect (Nelson, 1959, and Arrow, 1962). If innovators cannot rely to some degree on protecting the knowledge they produce, they are at a disadvantage vis-à-vis rivals who do not incur the often high fixed costs of generating that knowledge and could presumably imitate it at a much lower or no cost. Since appropriability of knowledge is always incomplete, externalities arise, creating a difference between the private and social marginal return of any new knowledge being generated—a disincentive to investment in innovation activities (Lopez, 2009). See also Crespi et al., 2011.

9   See Pagés and Lora, 2010. Although relevant, this discussion goes beyond the scope of this evaluation.

10 Buera et al., 2013.

11 OECD, 2013.

12 Ayyagari et al., 2011.

13 Wymenga et al., 2012.

14 A broad range of instruments are used to support SMEs: access to finance, innovation, development of skills and human capital, clusters, and value chain and fiscal incentives (Ibarrarán et al., 2009; OECD, 2013).

15 The World Bank devoted US$9.8 billion to SME projects in 2006-2012. For the same period, the IFC investment portfolio identified as benefitting SMEs amounted to US$25 billion (Independent Evaluation Group, 2013).

16 To identify the IDB projects that support SMEs, OVE reviewed approximately 300 individual loan documents for all PSD projects approved between 2006 and 2013 in three sectors: Agriculture and Rural Development; Financial Markets; and Private Firms and SME Development. (Figures A.1 and A.2 in Annex II show the evolution of Bank support to SMEs as a proportion of the Bank's portfolio and total PSD lending.)

17 This is in line with the Bank's other strategic documents that consider SMEs a strategic matter for PSD [Private Sector Development Strategy (GN-2598-7)], the Bank's Sector Framework Document on Support to SMEs and Financial Access (IDB, 2014) and the Bank in general [Report on the Ninth General Increase (AB-2764)].

18 These types of interventions usually imply the use of a range of financial or non-financial instruments, such as grants, subsidized loans and technical assistance and can potentially produce different results. Although relevant, this discussion goes beyond the scope of the evaluation.

19 See Beck and Demirguc-Kunt, 2006; Michelacci and Silva, 2007; and Canton et al., 2012.

Notes

[20] See OECD, 2012 and IDB (2014). In accordance with Stiglitz and Weiss (1981), some failures in financial markets are due to asymmetric information and agency problems. Banks hesitate to use interest rate changes to compensate for risk because it may lead to a riskier loan portfolio, thus setting a process of adverse credit selection. Banks do not provide or extend the amount of credit demanded even when the borrower is willing to pay higher rates. Thus credit rationing occurs if, among loan applicants who appear to be identical, some receive credit while others do not, or there are identifiable groups in the population that are unable to obtain credit at any price (OECD, 2006).

[21] Vermoesen et al., 2012; Cravo, 2011.

[22] The project BR-0331 (BNDES Micro and SMEs Support Program) is an example of an intervention that provides funding to financial intermediaries supporting SMEs' financing and credit guarantee schemes.

[23] See McKenzie (2012) for a review of business consulting program evaluations in developing countries. The Bank supports several programs aimed at lowering transaction costs, reducing informality, and improving regulations and market operations. These interventions may include policies regarding business registration, property registration, and regulatory frameworks. The project CO-T1268 (Strengthening Financial and Capital Supervisory Agency) is an example of a Bank project aimed at improving the SME business environment.

[24] See, for example, Attanasio et al., 2011; Rosholm et al., 2007.

[25] See, for example, Schmitz, 1995; Schmitz and Nadvi, 1999; Giuliani et al., 2005; and Martin et al., 2011). It could be argued that cluster is a more popular typology for these types of SME programs. OVE uses *agglomeration* because, although *cluster* has been widely used to name local-based development projects; it has been used in a broad and vague manner (Martin and Sunley, 2003). In fact, most cluster-based development programs work with the definition of "sizeable agglomeration of firms in a spatially delimited area," as set out by Altenburg and Meyer-Stamer (1999). Similarly, Van den Berg (2001) argues that cluster is mostly related to a local or regional dimension of networks.

[26] During 2000-2001, IDB supported 36 cluster-related operations amounting to US$650 million (IDB-DP-214). The projects CH-L1019, PE-L1035, JA-L1012, AR-L1022, UR-L1020, and BR-L1092 are examples of similar interventions. Pires et al. (2013) and the World Development Report (World Bank, 2009) highlight the potential impacts on SMEs of industrial agglomerations.

[27] Martin et al., 2011.

[28] Crespi et al., 2011

[29] Lundvall and Borrás, 2005; and Romer, 1986, 1990.

[30] See Audretsch and Link, 2012. CR-L1043 (Innovation and Human Capital for Competitiveness Program) is an example of the Bank's support to SMEs related to innovation. OECD (2013) indicates that innovation policies in general do not discriminate in favor of SMEs. However, many countries promote the integration of information and communication technologies in the SME sector.

[31] See Volpe and Carballo, 2010b. PN-L1014 (Competitiveness and Trade) and UR-L1007 (Programmatic Competitiveness Loan) aim to help SMEs access foreign markets. There is limited evidence on the effectiveness of export promotion on SMEs in developing countries, but Volpe and Carballo (2010a) provide evidence that smaller and relatively inexperienced firms, as measured by their total exports, benefit most from promotion actions.

[32] OECD, 2010.

[33] OECD, 2013.

[34] See Castillo et al., 2013b. In addition, the Bank is sponsoring a research project on Brazil, Costa Rica, and Mexico that includes studies focusing on the direct and indirect effects of cluster development interventions and on innovation spillovers.

[35] See Tan and Lopez-Acevedo (2010; Long and Zhang, 2011; and Machado et al., 2011.

[36] A number of similar papers focus on developed countries, but they do not provide a thorough comparative analysis (e.g., Zecchini and Ventura, 2009; Martin et al., 2011; Chandler, 2012).

37   The difficulty of performing a more comprehensive analysis based on multiple treatments arises from the need for extensive firm-level data. An evaluation that intends to shed light on how different types of support affect SMEs' outcomes requires identifying each individual firm and establishing whether it participated in various programs. This is not an easy task and explains the scarcity of studies that take a comprehensive approach.

38   The Strategic and Planning Department, the Department of Research and Chief Economist, the Integration and Trade Sector, and the Competitiveness and Innovation Division are the Bank's areas involved in these efforts. For instance, see Alvarez et al., 2012.

39   The General Law on SMEs of 2006 defines annual turnover as the annual income, including all taxes.

40   The Brazilian Institute of Geography and Statistics uses the same criterion as SEBRAE to define SMEs. For retail and services, SEBRAE defines microenterprises as having 9 employees or fewer, small enterprises as having 10 to 49 employees, and medium enterprises as having 50 to 99 employees. For industry and construction, SEBRAE defines microenterprises as having 19 employees or fewer, small enterprises as having 20 to 99 employees, and medium enterprises as having 100 to 499 employees.

41   See Häner, 2011. These statistics do not include medium firms.

42   Production and distribution of electricity, gas and water, construction, public administration, defense and social security, as well as international organizations and extraterritorial institutions are not classified under the manufacturing sector for the purposes of OVE's analysis.

43   SEBRAE, 2013.

44   OECD and ECLAC, 2013.

45   The development of a road-based and regionally concentrated transport infrastructure has played an important role in creating Brazil's high levels of economic spatial concentration, which are particularly high when compared to countries similar in size, such as the US. (Moreira et al, 2013).

46   On August 7, 2014, the General Law for Micro and Small Businesses was modified to increase flexibility with regards to taxes and to include more sectors, particularly service sectors that were not covered under the original law implemented in 2007. This new measure will benefit approximately 450,000 businesses and 140 activities with annual revenues of up to US$1.6 million. In addition, the National Single Registry, a new tax model, will be created to drastically reduce bureaucracy, and the computerization of records will accelerate the process of opening and closing a business.

47   IFC, 2011. Apart from the cost of taxes, which is already a major problem, entrepreneurs in Brazil also have to deal with the fact that Brazil has hundreds of thousands of norms regarding when, how much, and how to pay taxes (SEBRAE, 2013).

48   Brazil ranks 76 out of 144 and scores 4.0 out of 7.0 on infrastructure requirements based on the Global Competitiveness Index (World Economic Forum, 2014). Logistics costs particularly hamper SMEs as they complete production phases in-house and need a business environment with low transaction costs to facilitate business-to-business trade relations (OECD, 2014).

49   For instance, managing customs paperwork for exports of agricultural commodities in Brazil can take 12 times longer than in European Union countries (a full day versus a couple of hours) (World Economic Forum, 2014).

50   The backlog in patent processing and trademark registration reduced from 8.3 in 2010 to 5.4 years in 2011 (Moura et al., 2014). The authors estimate that a reduction of this backlog from 5.4 to 2.8 years, considering the US as a benchmark, would imply an increase of 0.1% in Brazil's economic growth in the long run.

51   Although public agencies and financial programs targeting SMEs dated from the 1960s, most of Brazil's SME policies focused on financial initiatives and were short-lived (Ferraro, 1995).

52   SIMPLES Law (1996) and SME Statute (1999) established the foundation for the SME legislation. In 2006, the Congress passed a new law for SMEs combining federal, state, and municipal taxes into one system (New SIMPLES Law)

Notes

[53] In this regard, see the 2003 Industrial, Technological and Foreign Trade Policy, the 2008 Productive Development Policy, and the 2011 Bigger Brazil Plan.

[54] The National Council comprises 13 ministers, 10 entrepreneurs, and 3 trade unionists. ABDI is the executive secretary of this Council, and its board is named directly by the President.

[55] The agency's top management body, the Deliberative Council, comprises representatives from the public sector (Ministry of Development, Industry and Trade, its Foreign Trade Chamber, the Ministry of External Relations, and BNDES) and the private sector.

[56] Created in 1972 as a public center responsible for providing managerial assistance to SMEs, SEBRAE became a private nonprofit organization in 1990. SEBRAE is funded by a monthly social contribution paid by employers.

[57] Over 30,000 items can be purchased using the BNDES Card, including vehicles, equipment for commercial automation, computers and peripheral products, software, refrigerators, gondolas, sewing machines, stationary engines, pumps and equipment for service sites, kits for natural gas engines, health care and dentistry equipment, commercial furniture, and paper.

[58] Apart from these evaluated programs, BNB also implements the largest microfinance program in LAC, known as Crediamigo, and the rural microfinance program, known as Agroamigo.

[59] An upfront sum of 3% of the financed amount is discounted to create a reserve fund of up to 30% of the total amount financed. The SME's shareholders provide 20% of the total in guarantees, and the remaining 50% is guaranteed by a Credit Guarantee Fund created by the local partners.

[60] The Metrology Bonus enables companies to access, at a lower cost, the calibration and testing services available at a national network of various laboratories that operate in partnership with SEBRAE.

[61] RAIS, provided annually by the Ministry of Labor, was established by Law nº 76.900 of 23/12/1975 to provide labor market information for the government and for research purposes.

[62] Salary Bonus is the annual payment of a minimum wage to workers in businesses, private entities, and public agencies that contribute to the Social Integration Program or Civil Service Asset Formation Program. Every establishment that has an official identification number contributes to these programs. Only workers that have been registered as formal employees for at least five years and that have received up to two monthly minimum wages in the previous year qualify to receive this benefit.

[63] RAIS became a well-established set of data in 1985. During the 1990s, it benefited from important advances in data quality. Since 1997, the data have been collected via Internet, which makes the data collection process quicker and more reliable. The Ministry of Labor considers the data to be of good quality and coverage from 2000 onward.

[64] SECEX microdata are publicly available at: http://www.desenvolvimento.gov.br/sitio/interna/interna.php?area=5&menu=2413&refr=603

[65] The impact on direct beneficiaries comprises only one component of the social returns of some of these programs. Their rationale is also related to externalities and spillover effects. Although relevant, the tracking of the impact of the programs on indirect beneficiaries – through labor mobility or geographical localization of firms – is beyond the scope of this evaluation.

[66] This is known in the literature as the fundamental problem of causal inference: it is impossible to observe the outcomes of the same unit in both treatment and non-treatment conditions at the same time (Holland, 1986). In an experimental design that consists of randomly dividing a representative sample into a treatment and a control group, the researcher aims to ensure that on average both observable and unobservable characteristics are balanced between the treated and untreated units, making the two groups comparable. In non-experimental designs, the research relies on a variety of statistical control strategies to reduce bias.

[67] Heckman (1979) shows that if there are unobserved factors affecting both the outcome itself and the probability of selection into the sample, the regression coefficients are biased and inconsistent. See also Griliches et al. (1999) for a discussion on selection bias.

68   In addition to the FE model, OVE applies difference-in-difference (DID) estimation as a robustness test purpose. The estimation strategy that uses a combination of PSM at baseline and the DID estimator is suggested by Crespi et al. (2011).

69   In turn, the DID model also controls for omitted variable bias by defining the counterfactual as changes in outcomes for the control group. DID estimation compares the before-after changes observed in the treated and non-treated establishments. This counterfactual change is then subtracted from the change in outcomes observed for the treatment group and the impact is estimated by DID. The first difference estimation used in the report is analogous to this strategy. See Ashenfelter and Card (1985) for a seminar paper applying DID, Duflo (2001) for a reference of a DID evaluation in developing countries, and Bruhn and McKenzie (2013) for an application of DID that is similar to the one used in this evaluation.

70   See Bruhn and McKenzie, 2013.

71   The adequacy of using PSM at baseline requires a time-invariant difference in these explanatory variables between the treated and control establishments. PSM also mitigates the selection bias derived from the potential correlation between establishments across different periods of time. See Rosenbaum and Rubin (1982) for a seminal paper on PSM.

72   Age and education of firm employees were analyzed regardless of the job position. To conduct the PSM, OVE applied a probit (probability plus unit) model and controlled for geographical location and activity. A probit model is a type of regression in which the dependent variable can only take two values: zero or one.

73   See the results of the propensity score regressions in Annex IX. Different PSM specifications led to similar qualitative results. The results of the probit estimates indicate that the coefficient of the average age of employees is negatively related with participating in a SME support program in all types of support, except for export treatment where this variable is not statistically significant. Interestingly, the probit estimates indicate that education is more important to determine participation in innovation and export programs. This result might be related to the fact that SMEs that innovate and export require employees with higher education levels. The higher the level of human capital is, the higher the probability of participating in a SME support program. For the other types of support, human capital is negatively related to the treatment or has a negligible influence in participating in a program.

74   The summary statistics of treated and control groups are presented in the next section.

75   The region of common support is defined as the area of overlap with observations of both treated and non-treated units.

76   The Nearest Neighbor technique matches establishments from control groups to treated groups based on the closest propensity scores. See Garone et al. (2012) for an example of estimation that applies nearest neighbor matching before the beginning of the program.

77   For a detailed explanation of the FE and DID models run by OVE, see model specification in Annex III.

78   Attrition bias occurs when the dropout of establishments generates a misinterpretation of results by changing the characteristics of treated and control groups and outcomes, regardless of the treatment.

79   For more details on attrition bias tests for panels, see Fitzgerald et al. (1998), Alderman et al. (2000), Alderman et al. (2001), and Verme (2008).

80   These results (similarities between the means of the main variables in balanced and unbalanced panels) are valid for both treated and non-treated groups.

81   This estimation can be considered a test of anticipatory effects. As for the use of lagged outcomes to test the unconfoundedness assumption, see Imbens-Wooldridge (2009). For the application of a specification allowing the testing of a placebo effect, see Stucchi et al. (2014). For a complete discussion on tests based on anticipatory effects, see Angrist-Pischke (2008).

82   In the case of credit interventions, the common support of the propensity score spans nearly the entire set of establishments.

83 As explained earlier, the nearest neighbor matching technique selects from the control group only the most similar establishment to each treated establishment based on their probability of being treated.

84 Annex XI (Tables A.XI-1 and A.XI-2) breaks down Table 2 by providing the number of observations by year of entry to the program.

85 To reduce the chances of collinearity by adding too many dummy variables (region and sector dummies) in the probit regression, OVE chose to control for sectoral variation in the FE model rather than in the probit regression. The literature of observational impact evaluation accepts as good practices either including exogenous variations in the probit regression or adding them as controls in the FE model.

86 The estimations for the impact of SME support services on innovation should be interpreted with caution as preexisting trends are not parallel.

87 As mentioned above, for the sake of robustness, OVE conducted alternative results using DID models. OVE also conducted robustness regression tests and found similar results by applying and not applying stratification of establishments (blocks) and using interaction with time. (See Annexes V, VI, VII and VIII).

88 The effective employment average is 23.36 for the sample of firms appearing over the whole period 2001-2012.

89 As explained earlier, the export data are in ranges. The magnitude of the estimated effect assumes that all establishments in a given "exports-value range" export the same average value. Thus, if the estimates generate a positive (negative) coefficient, it means moving up (down) across different ranges.

90 The results using the whole non-treated group ("non-treated group" in the Table 2) as the control group indicate that there is no effect of agglomeration on employment (Table A.V.I in Annex V). In addition, robustness tests using FE and 2002 as the baseline also suggest there is no impact of agglomeration treatment on employment (Table A. VIII-1 in Annex VIII).

91 As in the case of individual treatments, Annex V provides, as a robustness test purpose, alternative results using DID estimations.

92 The effect of agglomeration on employment is significant at the 10% level; thus this result should be interpreted with caution.

93 Coefficient γ from the interaction of the variable treatment with time provides indication about the amount of time elapsed until the effect of a treatment reaches its highest value in outcomes.

94 In this case, the amount of time that elapses until the effect of a treatment reaches its highest value in outcomes is given by $Yearsft_{it}^{opt} = -\theta/\gamma$.

95 For the positive interaction coefficient, the mathematical maximum of the derivative of the treatment variable with respect to time does not exist after the treatment, and there is no useful interpretation of the result.

96 Tan and Lopez-Acevedo (2010) compare several SME programs implemented in Chile and find no significant treatment effects for credit and loan programs alone. This suggests that access to finance by itself is unlikely to spur firms to make the necessary technological changes to improve performance. This could be interpreted as corroborating OVE findings that "credit design" matters for explaining the effectiveness of these programs.

97 Regarding evidence from developing countries, Clerides et al. (1998) do not find learning effects in Mexico, Morocco, or Colombia. On the other hand, Alvarez and Lopes (2005) find evidence of learning by exporting in the case of Chilean firms, and Fernandez and Isgut (2005) find the same evidence for Colombian firms. For a survey of empirical studies on the relationship between exports, innovation and productivity, see Ortega et al. (2013).

[98] See for instance Benavente et al. (2007). The authors evaluated the Chilean National Fund for Technological and Productive Development (1998-2002) and found a positive impact of the program on process innovation and on the firms' capabilities of interacting with external sources of knowledge and financing. However, the authors did not find evidence of any significant impact on the creation and adoption of new products during the timeframe used in their evaluation.

[99] It is important to note that resources allocated to agglomeration support or business consulting services may be used in activities not originally predicted by these programs. Pischke and Adams (1980) point out that the fungibility of resources may make programs difficult to evaluate.

[100] Arraiz and Stuchi (2013) also found that programs with value chain characteristics produce a positive effect on employment in Chile.

[101] Pires et al. (2013) suggest a methodology to identify potential clusters that could be used to test whether cluster projects have a positive impact in regions identified as potential clusters.

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