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Article

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Financial inclusion and its relationship with business growth of microenterprises in the manufacturing industry in Bogota during 2012–2016

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ABSTRACT

This study aims to investigate the correlation between components of financial inclusion and the growth of manufacturing microenterprises in Bogotá, focusing on the period from 2012 to 2016. Utilizing data sourced from the 'Annual Survey of Micro Establishments' provided by National Administrative Department of Statistics, the research includes an extensive literature review, a meticulous comparison of the financial inclusion components employed by these microenterprises and an evaluation of their impact on business growth using a linear panel data model with random effects. Findings suggests that microenterprises utilizing financial products exhibit sustained growth over time compared to those that do not. Furthermore, this study introduces an innovative perspective by quantitatively addressing the relationship between financial inclusion and the business growth of such companies in developing countries. As a recommendation, microenterprises should focus their efforts on establishing robust financial management practices, formalizing through RUT (Single Taxpayer Registry), adopting digitalization strategies and advocating for equitable financial inclusion policies. While the study contributes to the literature on financial inclusion, a more in-depth qualitative exploration of cultural and idiosyncratic factors is advised.

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1. Introduction

Microenterprises and small and medium-sized enterprises (SMEs) in Latin America and the Caribbean by 2020, according to data from the CEPAL (2020) represent 99.5% of all companies in the region. In the Colombian case, microenterprises together with small and medium-sized companies represent more than 99% of the companies in the country, generate approximately 79% of employment and contribute 40% to the Gross Domestic Product (GDP).

Despite their importance, microenterprises in Colombia face considerable obstacles, one of the most prominent being barriers to accessing financial services. Data from Confecámaras (2023) reveal that the five-year survival rate for microenterprises is only 33.4%, compared to 60.9% for small companies and 73.7% for medium-sized companies. This financial problem translates into low business growth and, in many cases, the closure of these companies.

In the context of the manufacturing industry, its contribution to the Colombian economy is undeniable. In the first quarter of 2023, this sector experienced a growth of 14.2%, contributing a solid 1.8 percentage points to the annual variation of GDP, which rose by 13.8% in current terms compared to the same period in 2022 (National Administrative Department of Statistics [DANE], 2023). Bogota, as the country's economic epicenter, is home to a significant sample of manufacturing companies.

The main objective of this study is to analyze the components of financial inclusion and its influence on the business growth of manufacturing microenterprises in Bogota from 2012 to 2016. This period is

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characterized by macroeconomic stability and low uncertainty, which minimizes the negative impact on microenterprises. The flow of this study involved the following stages.

- I. Identifying the advantages and disadvantages of different components of financial inclusion for microenterprises through a literature review.
- II. Comparing the various components of financial inclusion used by microenterprises in the manufacturing industry of Bogotá during the study period.
- III. Determining the business growth of microenterprises in the manufacturing industry of Bogotá after implementing a financial inclusion component during the period 2012–2016.

Within the scope of this study, ‘financial inclusion’ is defined as a multifaceted concept that encompasses both the supply and demand aspects of financial products. Key dimensions of financial inclusion involve access and utilization, with an evolving consideration of their nature or quality (Roa, 2013). Conversely, ‘entrepreneurial growth’, as outlined by Janssen (2009), primarily hinges on sales expansion and subsequent investments in additional resources to address emerging market needs.

This study will address the description and performance of two key financial products in the Colombian microenterprise market: online banking and microcredit. In addition, panel data econometric models with fixed and random effects will be used to evaluate the relationship between financial inclusion and its components with business growth.

The study seeks to evaluate the advantages and disadvantages of financial inclusion in the micro-manufacturing sector and its impact on business growth. It will explore the financial situation of microenterprises and the obstacles they face in expanding, due to limited access to tailored financial services. Colombian micro-manufacturers, in particular, struggle to obtain resources and contend with high interest rates, leading to increased operational costs (Lopera et al., 2014). As a result, their access to financial services is limited, impeding their potential for growth and overall success.

The paper is structured in several sections that allow a systematic approach to the relationship between financial inclusion and business growth in microenterprises. Section 2 provides an exhaustive review of the literature, examining the importance of financial inclusion in microenterprises and the mechanisms that link financial inclusion with business growth. Section 3 details the research design, including the methodological strategy, the data used, the description of the variables and the panel data model. The results are presented in Section 4, followed by a discussion in Section 5, which interprets the findings and relates them to the literature reviewed. Finally, Section 6 presents the general conclusions of the study.

2. Literature review

The investigation into microenterprises’ access to financial services has garnered significant attention from entrepreneurs, banks, financing platforms and academia. Access to these services is influenced by several factors, including the size of the financial system, cultural traits, innovation levels, education, government policies and the regional business landscape. This literature review involved a thorough examination of documents in scientific repositories to assess the existing understanding of this issue and identify emerging trends.

2.1. Financial inclusion in microenterprises

Financial inclusion, both in Latin American countries and in Colombia, has emerged as a central issue in the context of strengthening the micro-entrepreneurial fabric through financial products. This phenomenon is defined as the level of access and use of safe, accessible and sustainable financial services by individuals and companies in a country (Orazi et al., 2019).

This approach has gained relevance in the region’s economic development policy agendas. It is considered a fundamental tool for closing gaps and strengthening microenterprises and SMEs in each country (Sharma, 2016). Financial inclusion has become a consolidated concept, pointing to the access and use of formal financial products by individuals and groups (Cano et al., 2014).

In this context, several studies have agreed that financial inclusion has become a priority on the agendas of governments and multilateral organizations in emerging countries. This has translated into

tangible advances in the last decade, such as the design of simpler financial products, incentives for microcredit and insurance and the expansion of banking through technologies such as wallets and mobile accounts (Cano et al., 2014).

However, access to financial products does not impact all microenterprises in the same way, and this impact varies according to the economic sector to which they belong. According to Cheong et al. (2020), government policies in developing countries have focused on industries such as services and manufacturing because of their significant contribution to the economy. On the other hand, in Latin America, segmentation of financial markets and discrimination toward small and medium-sized enterprises have been persistent obstacles (Ferraro & Goldstein, 2011).

Persaud and Thaffe (2023), based on a structured review and bibliometrics related to financial inclusion (FI) in developing countries, proposed a model of the Financial Inclusion Diamond, highlighting the interdependence between key components of the financial inclusion ecosystem, regulated and influenced by various institutions such as private banks, technology and fintech companies and government entities. The authors highlighted that regulations affect access and quality of financial inclusion initiatives, evidencing disparities in approaches and results, especially in vulnerable populations. Furthermore, they highlight the significant role of ICT and fintech companies in promoting financial inclusion.

In the case of Colombia, financial inclusion has become a crucial challenge. Microenterprises and SMEs in the country, representing 99% of the approximately three million companies, only receive 14% of commercial loans. Limited access to financing, especially for microenterprises, has contributed to the persistence of informality in the business fabric (Vera & Tamayo, 2022).

For example, credit rationing hinders investment processes to improve innovation or expand production, or the scarce development of venture capital industries or financing for so-called emerging companies reduces the birth rate of companies and at the same time innovation in the country's economy (CEPAL, 2010). Despite efforts to improve access to financial services, obstacles such as illegality, informality and lack of collateral persist. These challenges manifest themselves uniquely in each economic sector, underscoring the need for differentiated and specific research for each industry (Vera & Tamayo, 2022).

Uruña-Mejía et al. (2023) analyzed the interaction between financial inclusion and the business practices of microenterprises in Colombia. The results revealed that microentrepreneurs who adopt more business practices have greater financial inclusion. Furthermore, a greater significant effect is found in men than in women, while formalization does not seem to influence financial inclusion. These findings emphasize the importance of improving business skills in microentrepreneurs and suggest more comprehensive public policy strategies to strengthen their financial inclusion.

In this context, this study focuses on a specific sector: the manufacturing industry. Despite the proliferation of studies on financial inclusion, few have delved into sector-specific analyses. This research aims to fill this gap by taking a closer look at how financial inclusion affects microenterprises in the manufacturing sector, providing detailed and specific insights that can inform public policy and business strategies.

2.2. Mechanisms of financial inclusion and their relationship to business growth in microenterprises

The literature has identified two main mechanisms for analyzing the financial inclusion of microenterprises: the use of online banking and microcredits (Chele Baque, 2018; Rivero Salgado, 2019; Zhang et al., 2023). According to Rivero Salgado (2019), online banking has generated a real revolution in terms of access to the banking system. Through this system and depending on the degree of access to banking services, microenterprises can perform the following services:

- Consult products and services offered by the bank.
- Perform financial transactions, especially wire transfers, among others.
- Apply for different financial products such as loans, programmed savings, among others.

In addition, taking into account the need to cover larger areas of the territory, in the case of Latin American countries such as Colombia, where rural areas or areas with difficult access are concentrated, the deployment of the financial sector with mobile and/or online banking has been essential to facilitate

the linkage and access to financial products to microenterprises and SMEs that were traditionally underserved (Vera & Tamayo, 2022).

On the one hand, Digital financial inclusion, focused on the use of affordable and sustainable digital financial services, represents a significant transformation in access to financial services. Financial technology (fintech) companies, particularly in developing countries, have led this revolution, offering fast and efficient solutions in areas such as payments, transfers and insurance. Zhang et al. (2023) investigated the implementation of digitalization policies in China, showing that digitalization outperforms traditional methods in easing financing constraints for SMEs. The results indicated that digitalization improves financial inclusion by reducing information asymmetry and expanding the coverage and depth of financial services available to SMEs.

Chele Baque (2018) emphasizes the importance of microcredit as a crucial tool for improving the conditions of microenterprises and SMEs. However, entrepreneurs aiming to strengthen their businesses through this financial product often face constraints in accessing it. These limitations are attributed in part to the strict requirements set by financial institutions for obtaining such credit.

The studies carried out by Anthanasius Fomum and Pieter (2023), Tia et al. (2023), Mahato and Jha (2023), Zreik et al. (2023) and Anga et al. (2021) exhaustively address the issue of financial inclusion in micro, small and medium-sized enterprises (MSMEs), although in different geographical contexts: the Kingdom of Eswatini, Ghana, Nigeria and China. These investigations highlight the determining influence of financial inclusion on the performance and development of MSMEs, fundamental sectors for economic progress and poverty alleviation.

The study by Anthanasius Fomum and Pieter (2023) found that access to financial services and savings practices, both formal and informal, have a positive and significant impact on the profits of microenterprises, especially in the middle and high percentiles of income. Likewise, their findings suggest that financial inclusion reduces the probability that microenterprises will be left behind in their development.

On the other hand, the analysis by Tia et al. (2023) in Wa Municipality, Ghana, reveals that aspects such as religion, awareness of loan services, business registration and preparation of financial statements are key elements in promoting financial inclusion. The authors recommend that financial service providers take into account variables such as social networks, business practices, gender and religion. Furthermore, they emphasize the importance of intensifying financial education, given that adequate knowledge of the financial products available is essential to promote financial inclusion.

Anga et al. (2021), based on their study in Nigeria, highlighted the positive relationship between financial inclusion and the performance of SMEs, emphasizing the beneficial impact of access to deposits/savings and banks. However, it is observed that access to credit negatively affects these companies. These results highlight the importance of developing policies that improve financial inclusion and facilitate access to financial services, being key to the growth and development of SMEs in said country.

Zreik et al. (2023) investigated microfinance in China, with a specific focus on microcredit and its influence on small business owners. They highlighted the need for financial inclusion in poor regions and Chinese coastal provinces, where an estimated 30% of the population is deprived of access to conventional banking services, due to factors such as geographic location, socioeconomic level, credit history and lack of adequate documentation. The findings emphasize the importance of microcredit for supporting microentrepreneurs in marginalized communities and point to the urgency of implementing digitalization strategies and effective regulations to expand access to financial services.

Mahato and Jha (2023) conducted a study in India investigating the impact of financial inclusion on sustainable livelihoods among Indigenous women entrepreneurs, finding both direct and indirect effects through micro entrepreneurship. Their research suggests that financial inclusion not only enhances profitability and access to financial services but also stimulates sustainable entrepreneurship. Specifically, microcredit has shown efficacy in facilitating access to and management of financial resources for micro-entrepreneurs, encouraging productive activities by improving financial management of income, savings and expenses (Estrada & Hernández Rubio, 2019).

For the Colombian case, several authors show that, in the financing and growth of microenterprises, microcredit is one of the most important alternatives in the market and has been growing in recent years. However, it is relevant to mention that in the country it has two main obstacles, first, it has high percentages of overdue portfolios, which makes it much more expensive for the banking entities and

this is reflected in the higher usury rates of the market and second, microcredits are a financial instrument little used by the start-ups since it does not have tools according to their innovation (Vera & Tamayo, 2022).

In summary, it is widely recognized that both mechanisms have demonstrated effectiveness in developing countries facing significant challenges in financial inclusion. Both online banking and microcredits influence the growth of microenterprises; however, further research is crucial to better characterize these financial inclusion mechanisms and draw more precise and consistent conclusions.

In contrast, the research conducted by Jiménez Sánchez (2014) highlights the importance of microenterprises having managers who are up-to-date and knowledgeable about new financial products that can benefit the microenterprise; however, the reality of the manager's business management can become limited in financial matters because of lack of knowledge and unfamiliarity with the financial system.

In this context, financial education is significant for microenterprises since it helps to find alternatives to maximize their economic resources, thanks to the use of tools that support the administrative and financial management and planning of organizations (Hernández Rivera et al., 2019). This is important because, by increasing knowledge, understanding and improving decision-making capacity in financial matters, the entrepreneur and/or manager of the microenterprise will have a holistic perspective of his or her company and business model, thus generating business and organizational growth that will translate into greater financial access.

Medina (2015) and Orazi et al. (2019) mention that financial education is an important challenge in financial inclusion given that it aims to reduce the asymmetry of information between intermediaries and financial consumers, in this case managers or company owners, through a support structure that informs in a clear, transparent and effective way when using different financial products.

For their part, E. García et al. (2023) analyzed the determinants of financial inclusion in Colombian microenterprises during 2015–2017, focusing on access, use, quality and well-being. Education, separation of personal and business finances, business formality and the use of information technologies were identified as key factors. The research concludes that greater financial education and technological skills increase the demand for financial services.

It is relevant to highlight that financial education seeks to bring the offer of financial services closer to the understanding by entrepreneurs, identifying what their needs are and which financial products in the market are useful to them and under which conditions (Zuleta J, 2017). In turn, this helps generate awareness of the demand for financial instruments and their effects on the development and sustainable growth of the company that uses them.

In this sense, financial education and knowledge are fundamental for financial inclusion. In Latin America, the literature shows that there is widespread ignorance among the population about basic concepts such as interest rates, risk and profitability. For example, less than half of the population in the region understands the term interest rate or knows how to make a basic calculation about it (N. García et al., 2013).

This leads to the conclusion that the lack of access to education and information is an obstacle for micro, small and medium-sized enterprises, which on many occasions do not have the capacity to understand financial products or the functioning of the system in general, so they refrain from using them, something that does not happen with large corporations (N. García et al., 2013). Another important challenge is the generation of an inclusive financial system with better access for all, with equal opportunities, managing to unlock the economic potential of the entire economy, thus fostering inclusive growth (Anthanasius Fomum & Pieter, 2023).

Additionally, in emerging countries, the restrictions to access financial products are significant, generating an initial gap between microenterprises and large corporations. One of the most important findings in the research conducted is that, regardless of the level of financial development of a country, it is much more difficult to access financial products when compared to large companies (Fan & Zhang, 2017).

In regions like Latin America and countries such as Colombia, financial systems should consider the specifics of rural and socially unequal areas, focusing on the financial inclusion of women and minorities, who are essential parts of the country's economic potential and often own microenterprises. However,

Table 1. Characteristics of financial products for microenterprises.

Product features	Description
Market analysis	Analysts must constantly study the market, both locally and globally, to identify opportunities for improvement in financial products, especially in microcredit.
Product Portfolio	A complete portfolio should be offered, including microcredit, savings accounts and financial education programs. This will allow microentrepreneurs to obtain benefits and discounts on products.
Profitability and price review	It is necessary to review the profitability and pricing model of the product, considering the possibility of reducing rates and offering differential rates according to the credit profile and the amount requested.
Flexibilization of risk and credit policies	It is suggested that risk and credit policies be made more flexible, especially for microentrepreneurs who do not have a solid credit history. Start with lesser amounts and evaluate repayment behavior before increasing the loan.

Source: Prepared by the authors based on Gamboa Fajury and Tovar López (2021).

there is a growing gender gap, making it increasingly challenging for women to access the financial system, whether for personal loans or for their own businesses or leadership roles (Vera & Tamayo, 2022).

These barriers faced by women are related to social and economic inequalities such as fewer educational possibilities in financial or economic issues, lower salaries, insecurity in the public space, economic dependence on their partners and many others that, despite advances, limit their possibilities when compared to men (Lazarte, 2022).

According to the research conducted by Gamboa Fajury and Tovar López (2021), inclusion must be generated through financial products with a relevant and differentiated value offer, which are clearly known by microenterprise managers. In turn, these products must be attractive and in line with the needs of the population and can be classified into four fundamental aspects. See Table 1.

Furthermore, informality poses a significant challenge for microenterprises, as their lack of formalization limits their access to the financial system and its associated benefits, crucial for their productive growth (Vera & Tamayo, 2022). Additionally, Martínez Oviedo and Reynoso Ibarra (2016) highlight that microenterprises are increasingly leveraging digital marketing in today's digital age. Consequently, the Internet, along with social media platforms, has emerged as a vital tool for the development and expansion of microenterprises, providing them with visibility and access to potential clients, thus enhancing their prospects for financial inclusion.

Finally, the main challenges of financial inclusion in microenterprises lie in the need to promote spaces in which managers and/or entrepreneurs can learn about the financial products offered by the market. Likewise, the products offered must have a comprehensive portfolio that is innovative and at the same time adjusted to the specific financial needs of the microenterprise.

The literature review highlights two fundamental gaps in the understanding of financial inclusion in Colombian microenterprises. Firstly, there is a lack of studies that address disparities between different sectors, despite the attention focused on access to credit or the use of financial products. This gap highlights the need for more exhaustive research, considering variables such as gender, internet access and the particularities of the industry. Secondly, the lack of attention to the specific challenges of informal microenterprises and the barriers that women entrepreneurs face in accessing financial services is highlighted. Although the worrying gap in financial inclusion associated with the persistence of informality is recognized, a more in-depth and differentiated analysis of the obstacles faced by these segments is required.

To address these gaps, more detailed research is proposed that goes beyond simple access to credit, exploring the various components that contribute to greater financial inclusion and, therefore, business growth. This comprehensive approach will contribute to a more complete understanding of the challenges and opportunities in the financial inclusion landscape for microenterprises in Colombia.

3. Research design

3.1. Data and methodological strategy

This study is based on field observation and analysis of data collected between 2012 and 2016, using the micro-establishment survey of the DANE in Bogota. The study population comprises manufacturing

Table 2. Database components.

Component	Description
Data type	Sample survey
Unit of analysis	Micro establishments of industry, commerce, or services with a maximum of 9 people employed. If these activities are conducted inside households, they are also subject to measurement. Mobile stalls are not included.
Coverage	Coverage in the 24 major cities and their metropolitan areas
Universe	The universe of the Micro Establishments Survey is comprised of 48,126 physical spaces, distributed in the seats of the municipal government of the 24 main cities.
Data collection model	Personal interview assisted with mobile capture devices

Source: Prepared by the authors with information from DANE.

microenterprises, and a representative sample of 21,825 observations from 4365 microenterprises per cluster was randomly selected.

According to DANE (2018), the information was collected through personal interviews conducted in the selected economic establishments, using Mobile Capture Devices (MCD) to fill out the questionnaires. The survey is composed of qualitative and quantitative panel-type variables; the published results of this survey refer to variables of economic activity, employed personnel, production, income, legal organization, operating time, online banking, among others (DANE, 2018). See Table 2.

For the study, a sample of 21,825 observations was obtained, meeting the required characteristics for analysis, including micro-establishments located in the city of Bogota whose economic activity is in the industry sector, serving as a proxy for the manufacturing sector. This specific sample selection allows for a more focused and relevant analysis to understand the specific dynamics of microenterprises within the context of the manufacturing industry in Bogota.

As for the methodological strategy, this study is based on a non-experimental quantitative correlational research design. In this design, as pointed out by Ramos (2015) the researcher explores various relationships between variables. Consequently, the research focus is on validating theories and empirical evidence that directly affect the dependent variable (business growth), with special emphasis on the financial inclusion variable.

To assess the relationship between financial inclusion and business growth, a balanced panel data model is used. This methodological approach is developed from previous research, such as the study conducted by Gómez Gómez et al. (2020) which analyzed the relationship between financial inclusion and productivity of manufacturing firms. In addition, the total sales variable is considered as an indicator of the entrepreneurial growth of the microenterprise over time, following the methodology proposed by Anthanasius Fomum and Pieter (2023). Other independent variables are explored, such as the level of formalization, time in operation, technological implementation and gender, influencers of the phenomenon.

It should be noted that the chosen study period, from 2012 to 2016, is characterized by macroeconomic stability in the country. This temporal choice minimizes the impact of economic crises that could generate instability and affect the performance of microenterprises in the sector. This temporal selection allows for an accurate analysis of the relationship between financial inclusion and business growth.

3.2. Variables

For the development of this research, the variables that characterize microenterprises in the manufacturing sector are taken into account, both economically and financially, according to the literature review and the methodological design. Thus, the variables to be considered are the following:

- Dependent variable: total sales.
- Independent variables: online banking, female owner, RUT (Single Taxpayer Registry), operating time, internet access, website, balance sheet and industry.

The variables listed in Table 3 are taken from previous studies elaborated previously by Medina (2015), Estrada and Hernández Rubio (2019) and Gómez Gómez et al. (2020) which have focused on Latin America, more specifically on Colombia. These studies addressed various aspects, such as economic,

Table 3. Econometric model variables.

Variable		Type of variable	Unit of measure	Remarks	Average	Standard deviation	Minimum value	Maximum value
ID	Overall	–	–	N = 21.825	323.003	10.446	300.289	339.069
	Between			n = 4.365		10.447	300.289	339.069
	Within			T = 5		0	323.003	323.003
Year	Overall	–	–	N = 21.825	2.014	1.414.246	2.012	2.016
	Between			n = 4.365		0	2.014	2.014
	Within			T = 5		1.414.246	2.012	2.016
Ln total sales	Overall	Dependent	COP (\$)	N = 21.825	1.755.342	1.238.482	921.034	220.042
	Between	– continuous		n = 4.365		1	1.479.133	2.043.803
	Within			T = 5		1	1.135.715	217.427
Female owner	Overall	Independent	–	N = 21.825	1	0	0	1
	Between	– dichotomous		n = 4.365		0	0	1
	Within			T = 5		0	0	131.551
RUT (Single Taxpayer Registry)	Overall	Independent	–	N = 21.825	1	0	0	1
	Between	– dichotomous		n = 4.365		0	0	1
	Within			T = 5		0	0	168.307
Ln operating time	Overall	Independent	Years	N = 21.825	1.307.991	0	0	1.609.438
	Between	– discreet		n = 4.365		0	0	1.609.438
	Within			T = 5		0	0	223.719
Internet access	Overall	Independent	–	N = 21.825	0	0	0	1
	Between	– dichotomous		n = 4.365		0	0	1
	Within			T = 5		0	–1	105.677
Website	Overall	Independent	–	N = 21.825	0	0	0	1
	Between	– dichotomous		n = 4.365		0	0	1
	Within			T = 5		0	–1	1
Industry	Overall	Independent	–	N = 21.825	0	0	0	1
	Between	– dichotomous		n = 4.365		0	0	1
	Within			T = 5		0	–1	1
Balance sheet	Overall	Independent	–	N = 21.825	0	0	0	1
	Between	– dichotomous		n = 4.365		0	0	1
	Within			T = 5		0	–1	1.002.612

Source: the authors.

financial, sectoral and formalization factors, among others, to understand the financial inclusion of micro-enterprises in this specific context.

Utilizing insights gained from previous studies and expertise in relevant fields, the chosen variables for this research endeavor to provide a nuanced understanding of financial inclusion dynamics within Bogota's manufacturing microenterprises. By carefully selecting these variables, the study aims to capture various aspects that influence financial access and inclusion, thereby offering a holistic view of the challenges and opportunities faced by microenterprises in accessing financial services during the specified study period.

3.3. Panel data model

Based on the object of the research, a linear model of a panel of data is proposed to measure the relationship between financial inclusion and business growth for a previously defined and observable population over the time window studied. For the development of this model, we start from the methodological approaches of Wooldridge (2002) and Pérez-Truglia (2009) for the development of a linear model with a panel of data.

To calculate the relationship between financial inclusion and business growth, the following equation is defined:

$$\begin{aligned} \ln(\text{Total sales}_{it}) = & \beta_0 + \beta_1 \text{Online Banking}_{it} + \beta_2 \text{Female Owner}_{it} + \beta_3 \text{RUT}_{it} + \beta_4 \ln(\text{Operating Time}_{it}) \\ & + \beta_5 \text{Internet Access}_{it} + \beta_6 \text{Website}_{it} + \beta_7 \text{Industry}_{it} + \beta_8 \text{Balance Sheet}_{it} + \alpha_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

The variables in the equation are defined as follows, see Table 4.

4. Results

This section presents the results of the econometric model, which are based on the methodology previously described. They highlight the influence of financial inclusion on microenterprise growth, revealing

Table 4. Description of the variables in the econometric model.

No	Variable	Description
1	$\ln(\text{Total Sales}_{it})$	Represents the natural logarithm of total sales in period t for microenterprise i .
2	$\text{OnlineBanking}_{it}$	Dichotomous variable indicating whether microenterprise i uses the financial product in its business in period t .
3	FemaleOwner_{it}	Dichotomous variable indicating whether microenterprise i is owned by a woman in period t .
4	RUT_{it}	Dichotomous variable that indicates whether microenterprise i has a RUT (Single Taxpayer Registry) in period t .
5	$\ln(\text{OperatingTime}_{it})$	Natural logarithm of the operating time of microenterprise i in period t .
6	$\text{Internet Access}_{it}$	Dichotomous variable indicating whether microenterprise i has Internet access in period t .
7	Website_{it}	Dichotomous variable indicating whether microenterprise i has a website in period t .
8	Industry_{it}	Variable representing the industry to which microenterprise i belongs in period t .
9	BalanceSheet_{it}	Variable that represents whether microenterprise i uses a balance sheet in period t .
10	α_{it}	Fixed effects that capture the invariant individual characteristics of each microenterprise and thus reduce endogeneity bias.
11	ε_{it}	Error term that captures the unobserved factors and random noise in period t for microenterprise i .

Source: the authors.

a positive relationship between both variables. A detailed analysis of the specific components that help explain this relationship will follow.

First, we proceed to estimate the panel data model with fixed effects. The results obtained are presented in Table 5.

Regarding the estimation of the panel data model with fixed effects, it is found that the variables 'Female Owner' and 'Industry' do not show a statistical significance in the business growth of the microenterprise; however, it is relevant to mention that, in order to reach this conclusion, a more detailed analysis of the relationship of these variables with the dependent variable should be carried out.

On the other hand, the variables that are significant at ($p < .01$) show the following:

- The variable 'Online Banking' has a coefficient of -4.75 , which shows that, with an increase in the use of this financial product, microenterprise sales are reduced by 4.75%.
- The 'RUT' has a coefficient of 0.15, which shows that, with the achievement of the single tax registry, the sales of the microenterprise increase by 0.15%.
- 'Ln Operating Time' has a coefficient of 0.30, which shows that, with a 1% increase in operating time, the microenterprise's sales increase by 0.3%.
- Both 'Internet access' and 'Website' show positive coefficients of 1.38 and 0.28 respectively, suggesting that having access to the Internet and having a website are associated with 1.38% and 0.28% increments in microenterprise sales.
- The use of a balance sheet in microenterprise accounting has a positive relationship with the growth in sales, which increase by 0.10%.

The results highlight the positive and crucial role that aspects such as formalization, operating time and online presence of a microenterprise have in relation to the long-term business growth of microenterprises. The results also indicate that a microenterprise is more likely to increase its sales if it is formalized, more experienced and online.

However, the use of financial products such as online banking is found to have a negative impact on the business growth of a microenterprise. This may be so because in a poorly formalized economic environment with low financial inclusion, the use of financial products may hinder sales and, therefore, hinder the business growth of microenterprises.

In addition, we proceed to estimate the panel data model with random effects (see Table 6).

The estimation of the panel data model with random effects shows that the variables 'Internet Access' and 'Industry' are not significant, which indicates that there is not enough evidence to determine that these variables are significant in the sales of the microenterprise. With regards to Internet access, it can be inferred that, in the context analyzed, the company lacks an adequate technology infrastructure to

Table 5. Model estimation with fixed effects.

Remarks	13.905					
F (8, 13.087)	6.23					
Prob > F	0.00					
Total (centered) SS	29.662.15			Centered R^2	-1.11	
Total (uncentered) SS	30.055.02			Uncentered R^2	-1.08	
Residual SS	62.571.61			Root MSE	2.19	
Ln total sales	Coefficient	Standard error	z	P > z	[95% confidence interval]	
Online banking	-4.75	1.82	-2.61	0.01	-8.32	-1.18
Female owner	-0.03	0.04	-0.94	0.35	-0.10	0.04
RUT	0.15	0.05	2.81	0.01	0.04	0.25
Ln operating time	0.30	0.06	5.36	0.00	0.19	0.41
Internet access	1.38	0.50	2.76	0.01	0.40	2.36
Website	0.28	0.09	3.01	0.00	0.10	0.47
Balance sheet	0.10	0.05	1.96	0.05	0.00	0.19
Industry	-0.03	0.22	-0.16	0.88	-0.46	0.39
Underidentification test (Anderson canon. corr. LM statistic):	13.140					
Chi-sq(1) p val	.0003					
Weak identification test (Cragg-Donald Wald F statistic)	13.146.00					

Source: Prepared by the authors with STATA.

Table 6. Model estimation with random effects.

Remarks	17.460					
F (8, 17.452)	13.06					
Prob > F	0.00					
Total (centered) SS	43.848.57			Centered R^2	0.00	
Total (uncentered) SS	43.903.10			Uncentered R^2	0.01	
Residual SS	43.641.81			Root MSE	1.58	
Ln total sales	Coefficient	Standard error	z	P > z	[95% confidence interval]	
Online banking	0.08	0.04	2.09	0.04	0.00	0.15
Female owner	-0.07	0.02	-3.18	0.00	-0.11	-0.03
RUT	0.08	0.03	2.49	0.01	0.02	0.14
Ln operating time	0.23	0.03	6.94	0.00	0.16	0.29
Internet access	0.01	0.03	0.42	0.68	-0.05	0.08
Website	0.06	0.04	1.43	0.15	-0.02	0.15
Balance sheet	0.13	0.03	4.67	0.00	0.08	0.19
Industry	-0.06	0.13	-0.47	0.64	-0.31	0.19

Source: Prepared by the authors with STATA.

boost its sales; at the same time, this model supports the idea that the sector in which it operates is not a determining factor in its business growth.

Now, the variables that are significant at ($p < .01$) show the following:

- The variable 'Online Banking' has a coefficient of 0.08, which shows that, with an increment in the use of this financial product, microenterprise sales increase by 0.08%.
- The fact that a woman is the owner of the microenterprise generates a 0.07% reduction in sales growth, negatively impacting the business.
- The 'RUT' has a coefficient of 0.08, which shows that, with the achievement of the single tax registry, the sales of the microenterprise increase its sales by 0.08%.
- The 'Ln operating time' has a coefficient of 0.23, which shows that, with a 1% increase in operating time, the microenterprise's sales increase by 0.23%.
- The use of a balance sheet in microenterprise accounting has a positive relationship with the growth in sales, which increase by 0.13%.

Table 7. Hausman test.

Variables	Coefficients		(b-B)	$\sqrt{\text{diag}(Vb - VB)}$ Standard deviation
	(b) ^a	(B) ^b		
	Model IV fixed effects	Model IV random effects	Differences	
Online banking	-4.75	0.08	-4.83	1.82
Female owner	-0.03	-0.07	0.03	0.03
RUT	0.15	0.08	0.07	0.04
Ln operating time	0.30	0.23	0.08	0.05
Internet access	1.38	0.01	1.37	0.50
Website	0.28	0.06	0.22	0.08
Balance sheet	0.10	0.13	-0.04	0.04
Industry	-0.03	-0.06	0.03	0.17

^aConsistent under Ho and Ha; obtained from xtivreg2.

^bInconsistent under Ha, efficient under Ho; obtained from xtivreg2.

$$\chi^2(8) = (b - B)'[(Vb - VB)^{-1}](b - B) = 15.42 \quad (2)$$

Source: Prepared by the authors with STATA.

$$Prob > \chi^2 = 0.0515$$

On the other hand, having a website with a significance of ($p < .15$) generates an increment in the sales of the microenterprise by 0.04%. It also recognizes the potential of being online to boost sales growth and therefore the growth of the microenterprise in the long term.

Finally, the Hausman test is performed to determine whether the linear model fits better with fixed effects or random effects (see Table 7).

Based on the null hypothesis of the Hausman test, which holds that the random effects model is consistent and efficient in the presence of unobserved individual errors, the result of the chi-square (χ^2) with eight degrees of freedom, yields a calculated value of 15.42 and a value ($p < .05$). The results obtained indicate that both the fixed effects model and the random effects model are adequate; however, we chose to use the random effects model because of its higher estimation efficiency, since this model takes into account the unobserved heterogeneity among the individual units of the data panel and therefore improves the precision of its estimation (Wooldridge, 2002).

5. Discussion

The previously developed econometric model confirms the significance of financial inclusion in the business growth of microenterprises. The results indicate a positive relationship between these two variables. However, it is imperative to delve into each of the studied components influencing this relationship, a discussion that will follow in the subsequent section based on the literature review conducted in earlier chapters.

The findings of this research significantly contribute to the body of evidence supported by various authors who emphasize the importance of financial inclusion in the business growth of microenterprises in developing countries. These results align with previous studies conducted by Anthanasius Fomum and Pieter (2023), Ayyagari et al. (2011) and Klapper et al. (2006), all concluding that access to formal financial services accelerates the growth of microenterprises, enabling them to explore new markets, enhance competitiveness and improve overall performance.

These findings are particularly relevant, providing empirical support to previous research focused on this relationship. The econometric model results demonstrate that financial inclusion acts as a catalyst for the business growth of microenterprises, especially in cities like Bogota, where these entities play a pivotal role in the business landscape.

According to Bhavani and Bhanumurthy (2014), financial development and access become critically important when internal finances are insufficient for maintaining and expanding manufacturing organizations. Similarly, formalized microentrepreneurs, incorporated into financial inclusion, exhibit enhanced economic development, reflected in increased income levels and business growth (Altamirano Salazar et al., 2019).

The analysis of the 'Online Banking' variable within the model reveals a noteworthy trend. A higher utilization of online banking is associated with a 0.08% increment in sales, underscoring the

potential impact of digital financial tools on the performance of microenterprises. This aligns with observations by Rivero Salgado (2019), emphasizing that the adoption of financial products, especially online banking, facilitates enhanced financial operations for microenterprises. Increased efficiency in financial transactions and improved accessibility to products like loans are highlighted as key advantages derived from the utilization of online banking, echoing the positive correlation identified in the model.

In this context, the econometric model results support the idea that the use of financial products positively impacts business growth. Moreover, they align with theoretical evidence emphasizing the importance of these products in improving the operations and market position of microenterprises (Rivero Salgado, 2019). Financial inclusion, particularly through products like online banking, allows microenterprises to strengthen their financial management, facilitating access to other financial products such as microcredit and better preparing them to compete in the business environment.

Regarding female owners of microenterprises, evident barriers to financial inclusion make it challenging to access financial products and credit services, as pointed out by Lazarte (2022). This limited context affects business growth opportunities for microenterprises led by women. The study also reveals a negative relationship between business growth and female ownership of microenterprises. Gender inequality in entrepreneurship poses a significant challenge for female entrepreneurs in terms of financial inclusion and business growth.

Despite advancements in Colombia to enhance access to financial products for historically marginalized populations, the gender gap continues to widen (Vera & Tamayo, 2022). These findings underscore the urgent need for a more equitable business environment and the development of financial products fostering equal opportunities for female entrepreneurs. Achieving this not only strengthens market competitiveness but also benefits both the country's business fabric and society at large.

This call to action emphasizes the crucial role of the public agenda in effectively addressing gender inequality in access to financial services. Recognizing that closing this gap is not only an ethical imperative but also a key strategy for driving sustainable economic growth and social inclusion, it highlights the importance of targeted policy interventions and initiatives to create an environment that supports gender equality in business and finance.

Regarding formalization and proper financial management, as Vera and Tamayo (2022) point out, informality limits the possibilities of microenterprises in terms of financial inclusion and business growth. The research sheds light on the impact of formalization, particularly through the acquisition of the RUT (Single Taxpayer Registry). The analysis of the 'RUT' variable reveals a noteworthy 0.08% increase in sales for formally registered microenterprises.

Formalization not only serves as a pivotal step in establishing credibility and trust within the financial system but also acts as a catalyst for expanding business horizons. The newfound credibility facilitates easier access to financial products, opening avenues for growth in areas that were previously inaccessible due to informal practices. This underscores the critical role of formalization not just in regulatory compliance but as a strategic driver for financial inclusion and sustainable business expansion.

Additionally, the variable describing whether the microenterprise uses a balance sheet in its accounting shows a positive relationship with sales growth. These findings reinforce the importance of education and proper financial management for financial inclusion and business growth, as mentioned by N. García et al. (2013). The use of the balance sheet provides an accurate view of the financial situation of a microenterprise, facilitating strategic decision-making and a realistic assessment of its assets, liabilities and equity. This financial transparency increases the possibilities of accessing financial products and improves the competitiveness of microenterprises, promoting their business growth.

In terms of internet access and online presence, the results confirm the relevance of digital platforms for microenterprises in their daily operations and business growth, as indicated by Martínez Oviedo and Reynoso Ibarra (2016). With access to the internet, microenterprises can increase their reach, offering more sales opportunities and the possibility of generating new customers.

Online presence through a website provides greater visibility for microenterprises' products and services, resulting in increased market positioning and the opportunity to expand operations. This online presence also plays a fundamental role in promoting financial inclusion, making microenterprise services

and products more transparent and accessible, thereby increasing the likelihood of these enterprises having access to financial products.

In summary, internet access and digital presence are intricately linked to financial inclusion and business growth for microenterprises. These findings underscore the importance of digitalization and formalization to improve the competitiveness and sustainable development of microenterprises, generating a positive impact on the economy and society at large.

6. Theoretical and policy implications

Firstly, this research emphasizes that microenterprises in the business environment face significant challenges in terms of financial inclusion. It becomes imperative for the National Government, in collaboration with the financial system, to implement policies and strategies aimed at promoting financial products that foster greater financial inclusion for microenterprises, thereby contributing to sustainable business growth over time.

Secondly, it reinforces the public agenda regarding the collaborative efforts needed in the financial system with the National Government. Campaigns focusing on education and training should be initiated, promoting these types of financial products and their financial management from a business perspective.

This study emphasizes the necessity of educational and training campaigns, not solely centered on promoting financial products but addressing crucial aspects like financial planning. Understanding the long-term benefits of financial inclusion is essential for the sustainable development of microenterprises. This comprehensive approach would empower entrepreneurs and strengthen the business environment against economic challenges.

In summary, from a theoretical standpoint, it is crucial to recognize financial inclusion as a fundamental element in the development of microenterprises, providing a new perspective to comprehend business dynamics in developing economies. Furthermore, from a public policy perspective, the emphasis is on implementing strategies that not only facilitate access to financial products but also promote comprehensive financial education.

7. Conclusions

This study delved into examining the relationship between financial inclusion and the business growth of microenterprises in the manufacturing sector in Bogota during the period 2012–2016. The research provided theoretical backing for the positive correlation between financial inclusion and business growth, substantiating this connection through a comprehensive empirical analysis using a panel data model with random effects.

The findings underscored the indispensable role of financial inclusion in the development of microenterprises in developing countries, particularly in localities like Bogota. These results not only aligned with previous research but also emphasized the pivotal role of financial inclusion in fostering business growth, echoing the conclusions drawn by various scholars.

The adoption of financial products, particularly online banking, has revolutionized the financial operations of microenterprises, offering streamlined processes and improved financial management capabilities. However, despite these advancements, there remains a notable gender disparity in financial inclusion, particularly affecting female entrepreneurs. This inequality poses significant challenges for women in accessing essential financial services and hinders their ability to fully participate in economic activities and entrepreneurial ventures. Addressing this gender gap in financial inclusion is crucial for promoting gender equality and fostering inclusive economic growth.

Critical factors such as formalization through the RUT (Single Taxpayer Registry), effective financial management, Internet access and online presence were identified as pivotal for the growth of microenterprises. Formalization through the RUT instilled confidence in the financial system, easing access to financial products and unlocking new growth opportunities. The incorporation of a balance sheet enhanced financial transparency, subsequently expanding the prospects for accessing financial services and elevating competitiveness.

Furthermore, Internet access and online presence played instrumental roles in broadening the reach and visibility of microenterprises in the market. These strategies not only amplified sales opportunities but also

fostered financial inclusion by enhancing service accessibility. Digitalization emerged as a critical factor for the expansion and competitiveness of microenterprises in an increasingly digitized business environment. The study also underscored the urgency of addressing gender inequality in entrepreneurship. Women-led microenterprises encountered additional hurdles in boosting their sales, emphasizing the imperative to promote financial inclusion policies and equitable opportunities for women microentrepreneurs.

In conclusion, financial inclusion, along with its various components, exerted a substantial impact on the growth trajectory of manufacturing microenterprises in Bogotá. Enterprises that embraced financial products witnessed consistent growth, yet obstacles such as unequal access to these services persisted, underscoring the need for further interventions. As recommendations, it is advised that microenterprises concentrate on establishing robust financial management practices, formalize through the RUT, adopt digitalization strategies and advocate for equitable financial inclusion policies. Additionally, future research is encouraged to broaden its geographic and sectoral scope and explore the experiences of microentrepreneurs in acquiring and managing financial products through qualitative approaches.

Authors contribution

Daniel Suárez, has made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; and drafting the work or reviewing it critically for important intellectual content; and final approval of the version to be published; and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Zuray Melgarejo, has made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; and drafting the work or reviewing it critically for important intellectual content; and final approval of the version to be published; and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Diana Oliveros, has made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; and drafting the work or reviewing it critically for important intellectual content; and final approval of the version to be published; and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Data availability statement

The data that support the findings of this study are available in figshare at URL: <https://figshare.com/s/fc94e7defd642613ac18> and DOI: <https://doi.org/10.6084/m9.figshare.24563227>, reference number: 24563227. These

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