

Finance-Growth Nexus in Time of COVID-19 Lockdown: Case of Iranian MSMEs

Iman Cheratian and Saleh Goltabar

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Iman Cheratian¹ and Saleh Goltabar²

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Send correspondence to:

Iman Cheratian

Tarbiat Modares University in Tehran

cheratian@acecr.ac.ir

¹ Economics research group, Academic Center for Education, Culture, and Research (ACECR), Tarbiat Modares University (TMU), Tehran, Iran. And National Competition Center, Tehran, Iran

² Economics research group, Academic Center for Education, Culture, and Research (ACECR), Tarbiat Modares University (TMU), Tehran, Iran. email: goltabar@acecr.ac.ir

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Abstract

This paper examines the relationship between access to finance and financial constraint to growth in sales and production for Micro, Small, and Medium Enterprises (MSMEs) in Iran. Our study, based on data from 486 enterprises across five provinces, demonstrates that external financing is positively associated with the growth of MSMEs. While firms' obstacle in accessing external financing exerts a negative and significant impact on growth. The results also indicate that access to technology, owner education, and new employment are positively related with the growth of firms. On the other hand, the experience of bankruptcy and labor adjustment has a negative and significant impact on the sales and production growth of MSMEs. Finally, financed firms that have not been affected by COVID-19 exhibit greater growth than those that have been impacted by the pandemic. However, in the absence of external financing, the decline in growth is more pronounced for firms that have been affected by the COVID-19 pandemic.

Keywords: Financial constraints, COVID-19, MSMEs, Sales growth, Production growth, Iran
JEL Classifications: D21, D22, G01, G21, H12

ملخص

تبحث هذه الورقة العلاقة بين الوصول إلى التمويل والقيود المالية للنمو في المبيعات والإنتاج للمؤسسات البالغة الصغر والصغيرة والمتوسطة في إيران. توضح دراستنا، المستندة إلى بيانات من 486 مؤسسة في خمس مقاطعات، أن التمويل الخارجي يرتبط بشكل إيجابي بنمو المشاريع الصغرى والصغيرة والمتوسطة. بينما تمارس عقبة الشركات في الوصول إلى التمويل الخارجي تأثيرًا سلبيًا وكبيرًا على النمو. تشير النتائج أيضًا إلى أن الوصول إلى التكنولوجيا وتعليم المالك والعمالة الجديدة ترتبط ارتباطًا إيجابيًا بنمو الشركات. من ناحية أخرى، فإن تجربة الإفلاس وتعديل العمالة لها تأثير سلبي وكبير على نمو المبيعات والإنتاج للمشاريع الصغرى والصغيرة والمتوسطة. وأخيرًا، فإن الشركات الممولة التي لم تتأثر بالكوفيد-19 تحقق نموًا أكبر من تلك التي تأثرت بالوباء. ومع ذلك، في غياب التمويل الخارجي، يصبح الانخفاض في النمو أكثر وضوحًا بالنسبة للشركات التي تضررت من جائحة الكورونا.

1. Introduction

The COVID-19 pandemic, which shares some similarities with the 2008-2009 financial crisis, has caused an even more severe disruption than the global financial crisis of 2007-2008. The pandemic mainly disrupted the financial ecosystem, affecting financial markets, business financing and the global economy at large. Therefore, it is expected that the pandemic will not only have a short-term effect on financial systems but also reshape many foundational components in the long run (Goodell, 2020). The COVID-19 pandemic has also resulted in a mutual impact to both credit demand and supply. This, in turn, has created significant challenges for the business sector, with liquidity shortages, the threat of bankruptcy, and income losses. During this period, characterized by revenue disruption, business lockdown and declining cash balances, firms in urgent need of liquidity have faced constraints in obtaining credit. Banks also have been reluctant to lend to borrowers with low credit quality and low asset values, making it even more difficult for firms to access the financing they need (Khan, 2022). The main objective of this study is to investigate the relationship between access to finance and growth in Micro, Small, and Medium Enterprises (MSMEs) in Iran, and to evaluate the moderating role of the COVID-19 pandemic on such a relationship. This extension to the recent body of literature on the financing of MSMEs is of great significance, given the lessons learned from the global COVID-19 pandemic, which demonstrated the significant and negative impacts on the business sector worldwide.

The COVID-19 outbreak in Iran had a significant impact on the domestic economy, which had already been suffering due to its dependence on oil, international sanctions³, negative economic growth⁴, and a high inflation rate⁵. Under these circumstances, Iranian firms experienced a 50% decline in sales growth during the first two months of the outbreak (SRTC, 2020). According to Borimnejad and Dehyouri (2022), 34% of business owners admitted to a decrease in income of more than 75% by the end of June 2020. Furthermore, when asked if they felt that their business had enough cash reserves to cope with revenue reduction, the majority (71%) responded negatively. However, since early 2022, firms have been seeking new sources of financing through bank loans and government grants, with the ratio of bank loans to deposits exceeding 82% (CBI, 2022a). Central Bank of Iran (CBI) data also indicates that banking loans to the industrial sector grew by 160% from 2014-2019 (CBI, 2022b). The Iranian government is confronted with financial difficulties amidst declining revenues from sanctions and the plummeting prices of oil and petroleum products. Consequently, the resources available for protectionist policies have become severely limited.

The novelty in this study can be classified into two aspects: The first and main contribution is the use of a unique dataset in empirical analysis. The dataset was constructed from a survey study conducted at the Academic Center for Education, Culture, and Research (ACECR) at Tarbiat Modares University (Tehran, Iran). The survey included a wide range of questions on different areas related to MSMEs. Our study's subsequent and core empirical contribution is the investigation and illumination of the effects of financial constraints on MSMEs growth from the perspective of a sanctioned country that has experienced a prolonged period of economic downturns. To the best of our knowledge, this is the first study to specifically evaluate

³ The U.S. withdrawal from the Joint Comprehensive Plan of Action (JCPOA) and the return of economic sanctions in May 2018.

⁴ The nominal GDP growth rate decline from 8.82% in 2016 to -2.25% in 2018 (World Bank, 2021)

⁵ 30.22% in 2018 and 34.62% in 2019 (World Bank, 2021)

the moderating role of the COVID-19 pandemic on the finance-growth nexus for MSMEs in an emerging economy.

Using Probit regression in our analysis, we have illustrated a positive relationship between access to finance and the growth of MSMEs in terms of sales and production. On the other hand, firms' obstacle in accessing external financing has a negative and significant impact on growth. Younger firms, those in operation for a period of 1 to 5 years, have exhibited greater growth in comparison to their older counterparts (6-10 years). Furthermore, access to technology, owner education, and new employment put positive and significant effects on firms' growth. Conversely, facing bankruptcy and labor adjustment have negative impacts on MSMEs sales and production growth. Finally, the study indicates that firms that have been financed and remain unaffected by COVID-19 exhibit greater growth than those that have been impacted by the pandemic. However, in the absence of external financing, the reduction in growth is more pronounced for firms that have been affected by the COVID-19 pandemic.

The paper's structure is organized as follows: Section 2 provides a short review of theory and evidence on the finance-growth nexus during crisis. Section 3 describes the data and methodology applied in this study. In Section 4, we present and discuss the empirical results. Finally, Section 5 offers our conclusion.

2. SMEs finance in time of crisis: theory and evidence

The importance of financial constraint on the survival, growth, and performance of SMEs have become a central topic of empirical studies in recent years. (see Appendix 1). Due to their limited financial resources, high dependence on bank loans, and high interest rates, SMEs may experience performance disruptions during prolonged economic crises (Cheratian et al. 2023a). Regarding the fact that large firms are better equipped to absorb cyclical fluctuations in demand, SMEs are more vulnerable to swings in revenue growth. This is particularly evident during a crisis, when firms' revenues decline and the need for bank credit increases. In this situation, SMEs may face a disadvantage in terms of production growth and market share compared to their larger counterparts. As a result, SMEs that face financial constraints may have a lower chance of surviving (Bakhtiari et al. 2020). In this context, based on data from the World Business Environment Survey, Schiffer and Weder (2001) demonstrate that SMEs frequently identify financial constraints as a major obstacle to their survival and growth.

In times of crisis, firms generally tend to decrease their investment propensity, regardless of the financing sources (Geroski and Gregg, 1997). This is because demand uncertainty makes investment behavior riskier than economic boom periods. During the crisis, economic uncertainty reduces banks' willingness to finance firms' investment projects due to the limited credit supply and higher credit costs (Khan, 2022). In this situation, SMEs encounter greater financial constraints than large firms due to the credit rationing by financial intermediaries (Arvanitis and Loukis, 2020). Economic uncertainty may lead to shocks to banks' liquidity and reduce their ability to raise additional capital which affects the supply of bank lending consequently (Kahle and Stulz, 2013). Additionally, credit reduction may be attributed to shocks affecting required guarantees and information asymmetries between borrowers and lenders, which can limit firms' ability to raise working capital (Holmstrom and Tirole, 1997). According to Bukvic and Bartlett (2003), the high cost of financing (in terms of banks' collateral requirements, credit

and loan costs, and bank fees and charges) is identified as a key financial constraint to SME growth. In this context, Cowling et al. (2012) argue that firms experiencing a decline in revenue during an economic crisis are more likely to benefit from external financing. However, only larger, more established firms are able to access financial resources, while SMEs are often completely cut off from credit during the initial months of the crisis. They also demonstrate the negative impact of financial institutions on economic recovery by ignoring the growth and economic stimulation potential of SMEs and blocking them from accessing critical financing.

Since 2020, and due to the worldwide COVID-19 pandemic, a new strand of literature has investigated the impact of pandemic-induced financial constraints on firms' dynamics. In this line, Koloma (2021) for the case of Senegal, examines the determinants of access to finance, sales reduction, and business growth vision during the COVID-19 pandemic. The results of his study show that MSMEs with access to financial credit experience a higher average treatment effect on sales decline compared to their counterparts without credit access. This finding indicates that the level of credit accessibility has a significant impact on the difference in sales decline between firms with credit and those without it. Lu et al. (2020) investigated the various impacts of COVID-19 on 4,807 SMEs in China. Their findings indicate that the most significant effect of the pandemic is the rise in cash flow risk for the SMEs, leading to bankruptcy and financial crises for these enterprises. The OECD (2020) examined the diverse impacts of the pandemic on SMEs and concludes that it affects them through both the supply and demand sides. Moreover, COVID-19 pandemic can disrupt SMEs' performance through financial markets and credit reduction.

Golubeva (2021) explored the finance-performance relationship under the COVID-19 outbreak for 5730 firms from 13 countries based on the World Bank Enterprise Survey. The results confirm that, during the COVID-19 pandemic, robust financing solutions primarily consist of equity contributions, followed by firms' cash balances and debt. This finding emphasizes the significance of equity financing as a stable source of funding during economic downturns, which can help alleviate financial strain caused by unforeseen fluctuations. In a recent study, Taghizadeh-Hesary et al. (2022) have identified the determining factors of the optimal credit guarantee ratio in four ASEAN countries (Singapore, Philippines, Indonesia, and Malaysia) by utilizing the vector autoregressive (VAR) approach. The authors' research sheds light on the importance of increasing the credit guarantee ratio in the ASEAN region, not only to assist SMEs surviving in time of COVID-19 pandemic, but also for the post-pandemic economic recovery.

Khan (2022) examines the impact of financing restrictions on the strategies adopted by SMEs to mitigate the economic disruptions caused by the COVID-19 pandemic. To this end, the author utilizes data from the COVID-19 Impact Follow-up Surveys that were conducted in 19 countries by the World Bank Enterprise Analysis Unit. The findings of the study show that previous bank-lending credit constraints had a significant effect on SMEs during the pandemic. Specifically, Khan's research reveals that credit-constrained firms were particularly vulnerable to the effects of the pandemic and were more likely to resort to alternative financing strategies such as trade credit, delayed payments to suppliers or employees, and reliance on government grants to address liquidity and cash flow issues.

In a close study to our research, Amin and Viganola (2023) have conducted a study on the impact of pre-pandemic financial conditions of firms on sales reduction during the COVID-19 pandemic,

focusing on 35 emerging and developing economies. The authors' findings shed light on the significant role of access to finance in mitigating the negative impact of the pandemic on firms' sales. The results reveal that firms with better access to finance are less likely to experience a decline in sales. Moreover, access to finance is particularly effective in preventing sales reduction when firms are concerned about the potential loss of skilled workers and hard-to-replace input suppliers due to production cuts. Regarding the role of financial constraints on firm's productivity under economic turmoil, Wong et al. (2023) by using the OLS method, analyzed the effect of financial constrained on TFP in the context of COVID-19 for China. Their results indicate that financing constraints play a critical role in inhibiting firm's TFP, with a more pronounced effect observed among small ones.

A review of current literature reveals that previous studies have primarily concentrated on the impact of financial constraints on firms' growth and dynamics during the global financial crisis of 2007-08, with less attention devoted to emerging economies (see Appendix 1). On the other hand, over the last three years, some studies have discussed the impacts of financial disruption brought by COVID-19 pandemic on firms' performance. The current literature, however, has overlooked the moderating role of COVID-19 on the finance-growth nexus, specifically with regards to the small business sector. For the case of Iran, there are some studies on how international sanction (as a usual term of crisis) influence the firm entry (Cheratian et al., 2021), firm resilience strategies (Cheratian et al., 2023a), firm pricing behavior (Ebrahimi, 2022), and business financial performance (Ghasseminejad and Jahan-Parvar, 2021). However, pandemic-induced financial constraints for the case of MSMEs in a country under international sanctions have not been investigated in the current literature. Therefore, our analysis aims to fill this gap in the literature.

3. Data and methodology

3.1. Data

The study drew its sample from a survey of 500 Iranian MSMEs that employ between 1 and 50 employees. Of these, 14 questionnaires were unusable due to missing responses, resulting in 486 questionnaires being analyzed⁶. The study utilized simple random sampling to select five of Iran's 31 provinces—Tehran, Khorasan Razavi, Kerman, Mazandaran, and Ilam—with the intention of enhancing representation and heterogeneity. Characterized by geographical diversity and varying extents of economic maturation, the chosen provinces proffer invaluable discernments. Regarding geographical dissemination, Tehran province is centrally situated, Razavi Khorasan lies eastward, Mazandaran northward, Kerman southward, and Ilam westward.

Concerning industrial expansion and financial markets, centrally positioned Tehran arises as a formidable economic bastion and commercial hub⁷, evidenced by its substantial 25.5% contribution to the national non-oil GDP⁸. Khorasan Razavi, the second most populous, exhibits salient industrial and economic maturation, contributing 5.8% to non-oil GDP. Mazandaran and

⁶ Based on Cochran's formula, the minimum sample size was calculated for a population of approximately 12,000 firms across five selected provinces. The sample firms from each province were selected proportionally to represent the total number of firms in that province.

⁷ Tehran Province is the most populous province of Iran with a population of more than 13 Million and Khorasan Razavi is the second populous province of Iran with a population of about 6.4 million based of General Population and Housing Census. National Statistics Portal of Iran. 2016. Available from: <https://www.amar.org.ir/english>.

⁸ The data are obtained from regional accounts of the Statistical Center of Iran. Available from: <https://www.amar.org.ir/english>.

Kerman provinces contribute 3.7% and 4.1%, respectively, to the non-oil GDP, signifying moderate levels of economic development. In contrast, Ilam province, with its relatively meager share of 0.6% in the non-oil GDP, confronts a multitude of challenges as one of Iran's least populated regions. These challenges include underdeveloped financial markets and insufficient infrastructure, which hinder its economic growth prospects. In summary, the incorporation of these heterogeneous provinces facilitates a comprehensive examination of Iran's economic development, encompassing business maturation, financial markets, tourism, and regional disparities.

The survey was conducted by the Academic Center for Education, Culture, and Research (ACECR) between December 2019 and September 2020⁹. The respondents were the owners or senior managers of the firms. Face-to-face interviews were conducted to collect data from the sample firms, which were proportionally selected based on the total number of firms in each province. The definition of each variable is presented in Table 1, while Table 2 provides descriptive statistics of the variables.

Table 1 Variable definition

Group	Definition
Dependent variable	
Sales growth	= 1 if firm has sale growth in the past 12 months; 0 otherwise
Production growth	= 1 if firm has production growth in the past 12 months; 0 otherwise
Variable of interest	
Access to finance	= 1 if the firm had access to finance in the past 12 months; 0 otherwise
Non-access to finance	= 1 if the firm had non access to finance in the past 12 months; 0 otherwise
Moderator	
Covid-19	= 1 if the firm affected by covid-19 lock-down; 0 otherwise
Control variables	
Age 1-5	= 1 if age of firm between one to five years old; 0 - otherwise
Age 6-10	= 1 if age of firm between six to ten years old; 0 - otherwise
Age 11-more	= 1 if age of firm eleven years old and more; 0 - otherwise
Size (Micro)	= 1 if number of firm's employees between 1 to 9; 0 otherwise
Size (Small&Medium)	= 1 if number of firm's employees between 10 to 50; 0 otherwise
Bankruptcy	= 1 if firm had been exposed to bankruptcy at least once during the sanctions period; 0 otherwise
Access to technology	= 1 if firm access to required technology; 0 otherwise
Owner education	= 1 if the business owner has university degree; 0 otherwise
New employment	= 1 if the firm employed new labor in the past 12 month; 0 otherwise
Labor adjustment	= 1 if the firm had a forced adjustment in the past 12 month; 0 otherwise
Labor training	= 1 if the firm organizes training courses related to improving the knowledge and skills of the labors; 0 otherwise
ISIC code dummy	= 1 if the firm classified on specific 2-digit ISIC code; 0 otherwise
Location dummy	= 1 if the firm located in specific province; 0 otherwise

3.2. Measures

3.2.1. Dependent variables

To conduct a more comprehensive analysis, we have adopted a methodological approach introduced by Rahaman (2011) and Jones and Jayawarna (2010) to utilize two outcome variables in dummy format that serve as proxies for measuring firm growth. These outcome variables include sales growth and production growth. A value of "1" is assigned to each outcome variable if a firm has experienced growth in its sales or production over the past 12 months. Conversely, a

⁹ Visit the ACECR website for more information on this project: <http://ergtm.acecr.ac.ir/fa/news/41121> (in Persian).

value of "0" is assigned if no growth has been observed. It is noteworthy that out of the 486 respondents, 121 reported experiencing sales growth in their businesses, while 126 reported experiencing production growth.

3.2.2. *Independent Variables of Interest*

As a variable of interest, the survey asked respondents about their financial constraints. In this regard, the study utilizes two binary scale variables, adapted from Cowling et al. (2018) and Lopez-Garcia and Puente (2012), to measure access to finance. The variable "*access to finance*" is assigned a value of "1" if a firm's demand for bank loans in the past 12 months is fully funded. Conversely, if the demand is not met, the variable is assigned a value of "0". The variable "*non-access to finance*" is assigned a value of "1" if a firm's demand for bank loans in the past 12 months remains unfunded; otherwise, it is assigned a value of "0". It is noteworthy that 20.9% of respondents opted for "access to finance", while 68.5% opted for "non-access to finance".

3.2.3. *Moderator*

The moderating variable under investigation in this study is the impact of the COVID-19 pandemic and the subsequent public lockdowns enforced following the official announcement of the virus' spread. The pandemic's shock has had a significant effect on firm growth, and the government has taken measures to minimize its adverse impact by increasing the availability of external finance to firms. To measure the impact of this factor, binary variables are employed. A value of "1" is assigned if the firm's owner or manager confirms that they have been affected by the COVID-19 pandemic, while a value of "0" is assigned if they have not been affected. Approximately 37% of the respondents indicated that their businesses have been impacted by the pandemic.

3.2.4. *Control variables*

Apart from the variables of interest, our estimation models take into account other crucial determinants of firm growth. However, it is important to note that our explanatory variables are limited to the data available in the survey.

Firm age: In early empirical studies, firm age usually has been ignored or considered as a variable closely associated with firm size. Nevertheless, recent studies have challenged this stance, contending that firm age should be considered an independent variable when assessing firm performance (e.g. Coad et al. 2013 and 2018; Haltiwanger et al. 2013). It was revealed that approximately 53% of the businesses are 11 years or older and two younger groups comprising equally of 23% of the businesses.

Firm size: Since the seminal work of Gibrat (1931), numerous empirical studies have investigated whether a firm's growth rate is dependent on its size or not (e.g. Blonigen and Tomlin, 2001; Lotti et al., 2003; Bentzen et al., 2012; Cowling et al., 2018). This concept is of great importance, as it has implications for market competitive dynamics and the potential for small enterprises to compete with larger counterparts. Also, out of 486 businesses in question, 60% of them have between 10 to 50 employees, while 40% have less than 10 employees.

Economic downturn: It is widely recognized that economic downturns and unfavorable financial market conditions can significantly impact the survival and performance of the firms (Cowling et al., 2015). In this regard, the results of many studies have demonstrated that small firms are more vulnerable to economic cycles and fluctuations than their larger counterparts. (Fort et al., 2013;

Siemer, 2014). Economic downturns can create a challenging and uncertain competitive environment that may affect the process of firm exit. During such periods, firms may face reduced demand for their products or services, which can lead to lower revenues and profitability. The results of this survey show that 315 out of the 486 respondent businesses to the posed question have declared that their businesses have been subject to bankruptcy at least once during the past year due to sanctions.

Technology acquisition: According to Solow (1956) model, the term of technology acquisition (such as new equipment, innovation and R&D) has been argued as an important element of growth at the firm-level (e.g. Tsai and Wang, 2008; Koellinger, 2008; Che and Zhang, 2018). Access to external technologies can provide firms with various benefits, including cost reduction, decreased development time, and reduced environmental risks, ultimately leading to improved output performance (Henderson and Cockburn, 1996; Chatterji, 1996; Sakas et al., 2014). The survey findings indicate that about 65% of respondent businesses access to required technology.

Owner education: Recent empirical literature suggests that managerial human capital can significantly enhance firm productivity. Specifically, managerial vision, which includes capabilities such as effective monitoring, target setting, and implementing appropriate incentives, can have a substantial impact on firm productivity. Furthermore, managerial education levels have been shown to result in significant differences in firm productivity across various sectors and regions. (Queiró, 2016; Maliranta and Nurmi, 2019). About 65% of respondents mention that business owners have university degree.

Human capital: Resource-based theory suggests that differences in firm performance can be traced to uneven allocation of valuable resources, including human capital, across organizations (Crook et al., 2011). Accordingly, a series of studies have focused on human capital as a crucial element of sustainable competitive advantage and superior performance for businesses. For the new employment (Panayotopoulou et al., 2010) and labor adjustment (Qiu, 2019), the survey asks respondents about their recruitment of new employees during the past year, 66% have stated that they have hired new employees. Regarding the question about workforce adjustment, they have reported a 52% adjustment in their workforce during the past year.

Labor training: Training can provide required knowledge and skill for labor forces that may improves firm performance (Thang et al., 2010). According to the resource-based theory, firms which utilize skilled human resource are enable to achieve to a competitive advantage as it cannot be bought or imitated by market competitors (Barney, 1991). In this regard, several studies have found a positive relationship between labor training and firm success such as sales, profitability, and labor productivity (Bartel, 2000; Sung and Choi, 2018). The survey findings have shown that 57% of the surveyed businesses have provided training courses for their employees.

Table 2: Descriptive statistics

Variables	Mean	S.D.	Min	Max	Obs.
Dependent Variable					
Sales growth	0.248	0.432	0	1	486
Production growth	0.259	0.438	0	1	486
Variable of interest					
Access to finance	0.209	0.407	0	1	486
Non-access to finance	0.685	0.464	0	1	486
Moderator					
Covid-19	0.370	0.483	0	1	486
Control Variables					
Age 1-5	0.234	0.424	0	1	486
Age 6-10	0.234	0.424	0	1	486
Age 11-more	0.530	0.499	0	1	486
Size Micro	0.401	0.490	0	1	486
Size Small and Medium	0.598	0.490	0	1	486
Bankruptcy	0.648	0.478	0	1	486
Access to technology	0.658	0.474	0	1	486
Owner education	0.656	0.475	0	1	486
New employment	0.668	0.471	0	1	486
Labor adjustment	0.524	0.499	0	1	486
Labor training	0.576	0.494	0	1	486

3.3. Model

Due to the binary nature of our dependent variable, sale (production) growth, we have opted to use Probit regression with robust standard errors¹⁰, following the recommendation of Long (1997), Aldrich and Nelson (1984), and Cameron and Trivedi (2010). Cohen et al. (2013) suggest that moderation occurs when the independent variable and the moderating variable have mutual effects on the variance of the dependent variable, over and above what can be explained by the direct effect. The empirical model is specified as follows:

$$\begin{aligned}
 & \text{Sales (or production) Growth}_i && \text{Eq.(1)} \\
 & = \beta_0 + \beta_1 \cdot \text{Access to External Finance}_i + \beta_2 \\
 & \cdot \text{Affecting by Covid} - 19_i + \beta_3 \\
 & \cdot [\text{Access to external finance} \times \text{Affecting by Covid} - 19]_i + \sum \beta_c \\
 & \cdot \text{Controls}_c + \varepsilon_i
 \end{aligned}$$

4. Empirical results

4.1. Probit regression

The results of our Probit regressions are presented in Table A, which includes four models estimating the impact of access to finance on two dependent variables: sale growth and production growth. We have included control variables in each specification to provide a comprehensive analysis. Across the four estimations, our findings indicate a significant and positive relationship between access to finance and firms' sales growth and production growth in Iran. This result is consistent with previous research conducted by Beck et al. (2005; 2008), Cowling et al. (2012; 2016; 2018), and Eggers (2020). In contrast, we observe a negative relationship between financial

¹⁰ Corrects the standard errors for heteroscedasticity.

constraints and firm growth (both sales and production), which is supported by Beck (2005), Aghion et al. (2007) and Ferrando & Ruggieri (2018).

In terms of the control variables, our results reveal that young firms (aged 1 to 5 years) experience greater growth compared to older firms, consistent with Battisti et al. (2021). Additionally, we discovered that exposure to bankruptcy has a noteworthy negative impact on firm growth. This is consistent with Cowling et al.'s (2015) prior research, which revealed that economic downturns and unfavorable financial market conditions can harm firms. Moreover, our findings suggest that access to technology positively impacts the sales (and production) growth of a firm, supporting the claims of Sakas et al. (2014) that firms can gain a sustainable competitive advantage through technology. Furthermore, we find that owner education is positively linked to firm growth, which is in line with the findings of Maliranta and Nurmi (2019). Our results also reinforce the evidence that firm growth and productivity can be enhanced through the hiring of new labor, as per the research of Subramony et al. (2008). However, we observe that the relationship between labor adjustment and firm growth is negative, which concurs with the idea that job insecurity can lead to lower effort from other workers, reduced employee involvement in their jobs, and weaker commitment to the company, as stated by Umkehrer (2019).

Finally, we note that the main effects and interaction terms in Table 3 are not significant. Overall, our findings suggest that access to finance, young firm age, exposure to bankruptcy, technology access, owner education, and new labor hires are important factors in driving firm growth in Iran.

Table 3. Results of Probit regression models

Dependent Variable	Model (1)	Model (2)	Model (3)	Model (4)
	Sale Growth	Sale Growth	Production Growth	Production Growth
Independent variable				
Access to finance	0.8419***		0.7301***	
Non-access to finance		-0.6322***		-0.7224***
Control Variables				
Age 1-5	0.8285**	0.7109*	0.8489**	0.7466*
Age 6-10	0.7813*	0.6089	0.8264**	0.6919*
Age 11-more	0.5364	0.4179	0.4701	0.3722
Size (Micro)	0.1742	0.2433	0.5591	0.6241*
Size (Small and Medium)	0.0911	0.1349	0.4421	0.4819
Bankruptcy	-0.5442***	-0.5429***	-0.5244***	-0.5371***
Access to technology	0.3052*	0.2934*	0.4453***	0.4597***
Owner education	0.3388**	0.3908**	0.4555***	0.4825***
New employment	0.8221***	0.8398***	0.8076***	0.8471***
Labor adjustment	-0.3516**	-0.4026***	-0.1631	-0.2123
Labor training	-0.1319	-0.1539	-0.0374	-0.0586
Dummy ISIC Code	Yes	Yes	Yes	Yes
Dummy Location	Yes	Yes	Yes	Yes
Moderator: main				
COVID-19	-0.0633	-0.0591	-0.1564	-0.2918
Interaction terms				
Access to finance × COVID-19	-0.2164		-0.2051	
Non-access to finance × COVID-19		-0.0771		0.1244
Model fit statistics				
C	-5.4688***	-4.6723***	-6.0681***	-5.1300***
N. Obs.	478	478	475	475
W. chi2	426.22	427.69	440.68	406.09
Prob.	0.0000	0.0000	0.0000	0.0000
Log L.	-212.8392	-214.0712	-212.6117	-210.5085

Note: (a) *** p<0.01, ** p<0.05 and * p<0.1. (b). Standard errors are robust.

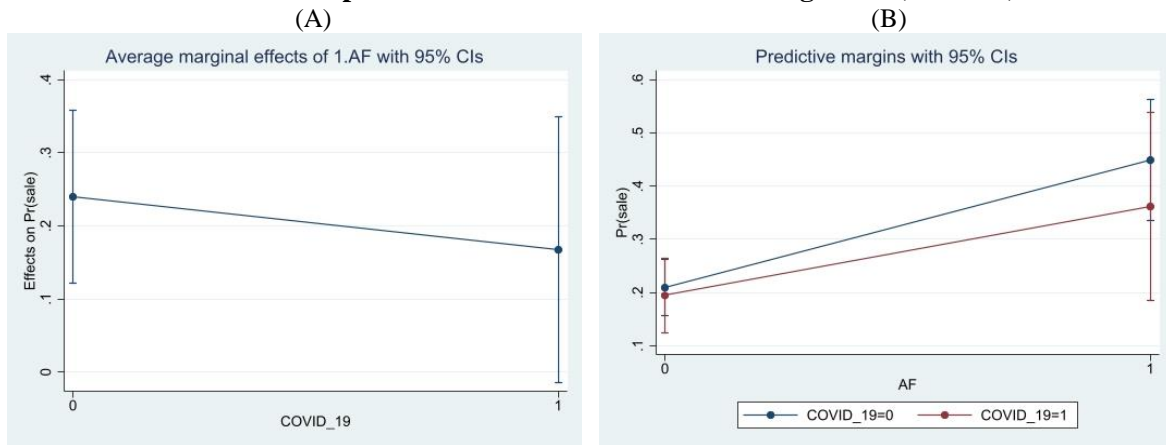
4.2. Marginal effects

The following discussion of results examines the Probit marginal effect of the COVID-19 moderator. However, using coefficient estimates from the Probit model does not allow for any statistical inferences about independent and interaction variables for two reasons. Firstly, the marginal effect of an independent variable may not equal the variable's estimated coefficient. Secondly, an interaction variable in a nonlinear model has its own conditional marginal effect, which depends on all values of the independent variable in the sample. Therefore, in a nonlinear model such as Probit, the effect of a moderator variable on the relationship between the independent variable and the dependent variable is examined by testing the statistical significance of the moderator variable's marginal effect across all sample values, as per Brambor et al. (2006).

Figure 1-4 illustrates the average marginal effects and predictive margins after four Probit estimates that examine the relationship between access (and non-access) to finance and firm growth, with robust standard errors, on the probability that a firm is affected by COVID-19 lockdowns. Our analysis reveals that the marginal outcomes from the interaction terms are more informative than the Probit model. Specifically, all interaction terms' marginal effects are statistically significant.

Overall, our results suggest that the relationship between access to finance and firm growth is moderated by the COVID-19 pandemic, and the marginal effects of the interaction terms are important for understanding this relationship. By considering the conditional effects of the moderator variable, we gain a more nuanced understanding of how access to finance affects firm growth during the pandemic.

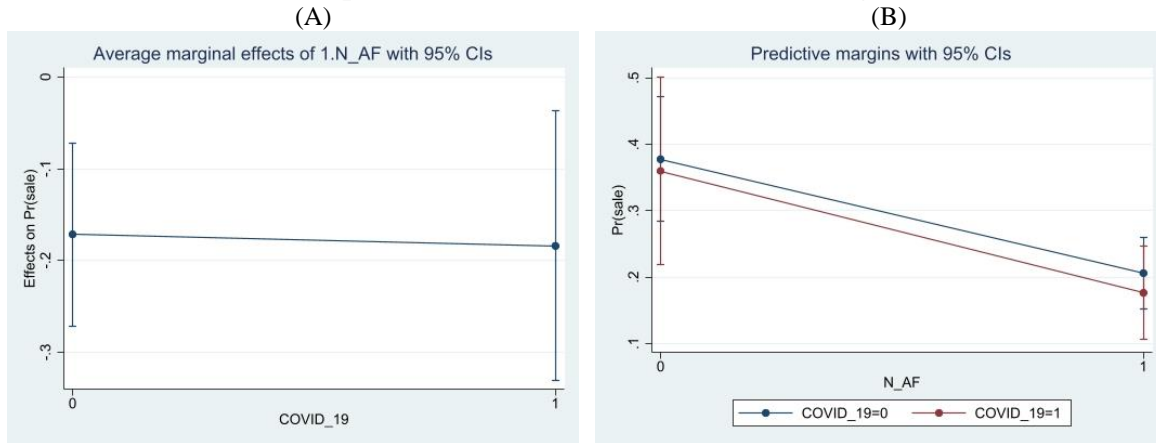
Figure 1: Average marginal effects and predictive margins for different levels of COVID-19 effectiveness on relationship between access to finance and sale growth (Model 1)



Figures 1(A) and 1(B) illustrate the relationship between access to finance and sales growth with moderating effects of COVID-19. Our findings indicate that firms with access to external finance experience higher sales growth than those without, regardless of whether they are affected by COVID-19 lockdowns. Moreover, financed firms that are not affected by COVID-19 experience more sales growth compared to those that are affected. However, non-financed firms that are affected by COVID-19 exhibit slightly lower sales growth compared to those that are not affected.

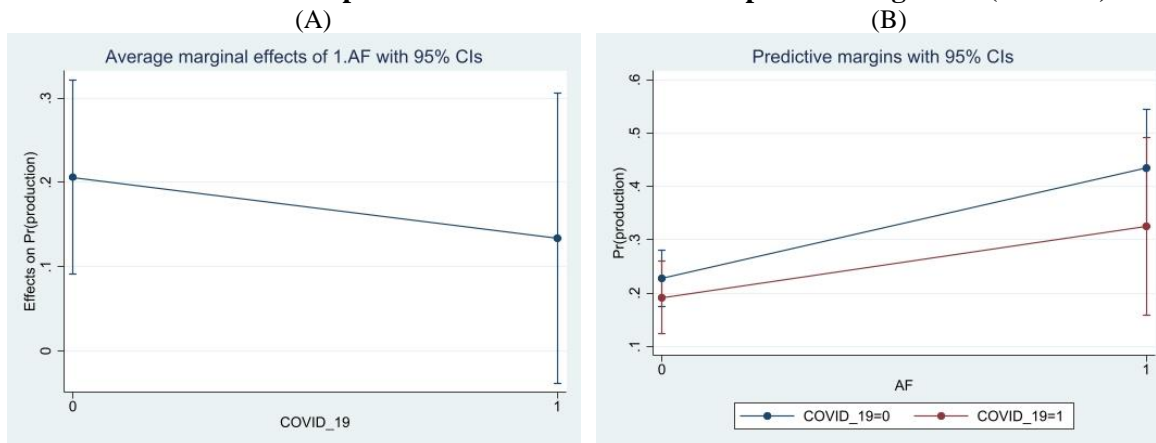
Overall, our results suggest that access to finance is an important factor in driving sales growth, particularly during the COVID-19 pandemic. Financing can help firms overcome the challenges posed by the pandemic, which is evident in the higher sales growth of financed firms. However, non-financed firms that are affected by the pandemic may struggle to maintain sales growth, highlighting the importance of external funding during times of crisis.

Figure 2: Average marginal effects and predictive margins for different levels of COVID-19 effectiveness on relationship between non-access to finance and sale growth (Model 2)



Figures 2(A) and 2(B) depict the relationship between non-access to finance and sales growth, with the moderating effects of COVID-19. Our results, consistent with those obtained from Figure 1, reveal that the absence of access to financing significantly decreases sales growth. The reduction in sales growth is more pronounced for firms that have been impacted by the COVID-19 pandemic. Overall, our findings suggest that the lack of access to finance can have a detrimental effect on firms' sales growth, particularly during times of crisis such as the COVID-19 pandemic. Policymakers and stakeholders should therefore consider implementing measures to ensure that firms have access to adequate financing to support their growth and sustainability.

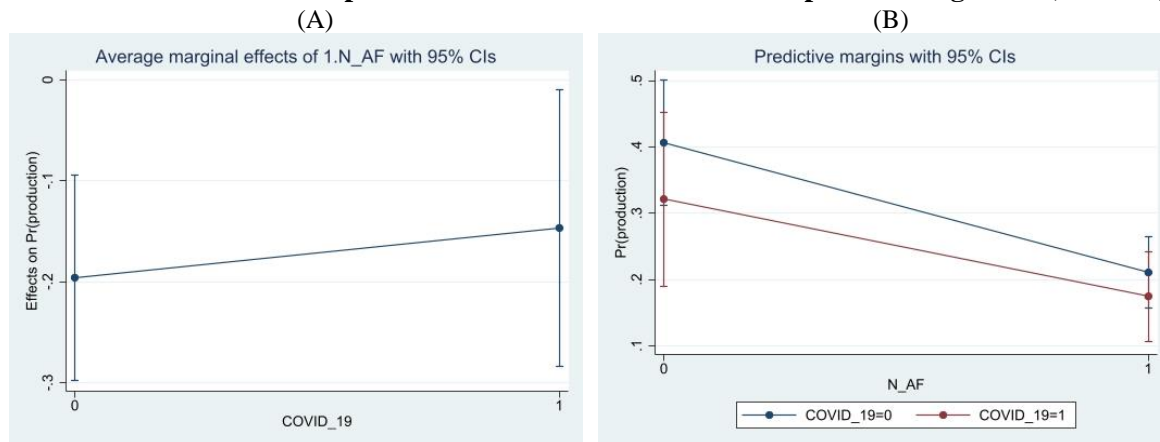
Figure 3. Average marginal effects and predictive margins for different levels of COVID-19 effectiveness on relationship between access to finance and production growth (Model 3)



Figures 3(A) and 3(B) depict the relationship between access to finance and production growth, with the moderating effects of COVID-19. Our results indicate that regardless of whether a firm

is affected by the pandemic or lockdown measures, non-financed firms experience less production growth compared to financed firms. Moreover, financed firms that are affected by COVID-19 exhibit less production growth compared to those that are not affected. As seen in the figures, the impact of the COVID-19 pandemic and quarantine measures on production growth is relatively high. Firms that are financed are better equipped to handle these challenges, but even they experience a decrease in production growth during the pandemic. Overall, our findings suggest that access to finance is an important factor in driving production growth, and can help firms navigate through challenges posed by the pandemic.

Figure 4: Average marginal effects and predictive margins for different levels of COVID-19 effectiveness on relationship between non-access to finance and production growth (Model 4)



Figures 4(A) and 4(B) illustrate the relationship between non-access to finance and production growth with moderating effects of COVID-19. As anticipated, the absence of access to finance is negatively associated with production growth. As discussed in Figure 3, the impact of COVID-19 on firms that had access to financing was more significant, as they had a higher level of production that was more severely impacted by pandemic lock-dawns. Thus, their production levels experienced a more pronounced decrease. This effect was also observed for non-financed firms, but the intensity of the effect was comparatively lower.

Our study analyzed the impact of access to finance on firm growth during the COVID-19 pandemic using Probit models and Marginal Plots. Our findings suggest that the relationship between access to finance and firm growth is moderated by the COVID-19 pandemic, and the marginal effects of the interaction terms are important for understanding this relationship. Firms with access to financing experience higher sales and production growth compared to those without, regardless of whether they are affected by pandemic lockdowns. Also financed firms were hit harder by the pandemic, experiencing a more pronounced decrease in growth. Our findings highlight the importance of access to financing for firms' growth and sustainability, particularly during crises like the pandemic. Policymakers should prioritize measures to ensure firms have access to financing to support their growth and mitigate negative effects.

5. Summary and conclusion

This study investigates the relationship between access to finance and financial constraints on the growth of Micro, Small, and Medium Enterprises (MSMEs) in Iran, with a particular focus on the moderating effects of the COVID-19 pandemic. Using a unique dataset constructed from a survey study conducted at the Academic Center for Education, Culture, and Research (ACECR) at Tarbiat Modares University in Tehran, the study sheds light on the impact of financial constraints on MSMEs growth in a sanctioned country that has experienced a prolonged period of economic downturns. The study reveals that external financing has a positive association with the growth of MSMEs in terms of sales and production. Conversely, obstacles to accessing external financing have a negative and significant impact on growth. Furthermore, the study finds that younger firms exhibit greater growth compared to their older counterparts, with access to technology, owner education, and new employment having significant positive effects on firms' growth. Conversely, facing bankruptcy and labor adjustment negatively impacts MSMEs' sales and production growth.

Moreover, the study examines the moderating role of the COVID-19 pandemic on the finance-growth nexus for MSMEs in Iran. The findings suggest that firms that have been financed and remain unaffected by COVID-19 exhibit greater growth than those that have been impacted by the pandemic. However, for firms that have been affected by the COVID-19 pandemic but have not received external financing, the reduction in growth is more pronounced. The study underscores the importance of improving access to financing for MSMEs' growth and sustainability, particularly during crises like the COVID-19 pandemic.

Overall, despite the extant limitations in data aggregation and the cessation of numerous enterprises during the peak of the COVID-19 pandemic in Iran, this study furnishes critical perspectives into the financing of MSMEs and illuminates the pivotal role of external financing in bolstering MSMEs' growth and sustainability. The findings contribute to the enduring discourse on the impediments encountering MSMEs in nascent economies, particularly within the milieu of a sanctioned country and a global pandemic.

6. Policy implication

Some policy implications may be inferred from the findings of this study. First, authorities should prioritize measures towards enhancing MSMEs' access to finance. This could include providing government-backed loans, subsidized loans, low-interest loans, guarantees or grants, incentivizing bank lending and developing alternative financing channels such as peer-to-peer lending, as well as enacting policies that encourage crowdfunding and angel investment. Second, policymakers should work towards creating a favorable business environment that encourages entrepreneurship and innovation, which can help MSMEs grow and create jobs. These policies should aim to reduce the bureaucratic hurdles and stringent requirements that often hinder MSMEs' ability to secure financing. Third, policymakers should consider implementing policies that address the specific challenges faced by MSMEs during crises like the COVID-19 pandemic, such as provision of emergency funding, debt relief, moratoriums on loan repayments, tax breaks, easing regulations and requirements for lending or other financial assistance to assist these businesses in recovering and regaining their footing. Eventually, a policy mix of facilitating financing access, providing targeted support during crises, and developing resilient financial channels for MSMEs could create a more conducive environment for their growth and sustainability. However, it is imperative that governments continue to monitor the situation and accordingly modify their policies as required.

to guarantee the long-term resilience and sustainability of MSMEs. Meanwhile, many Iranian banks do not furnish additional services and there is an absence of well-defined regulations or frameworks for financial monitoring, evaluation, and advisory services. Furthermore, extant regulations and procedures for furnishing financial assistance to MSMEs through Iranian banks are uncoordinated and deficient in efficiency (IPRC, 2016).

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Appendix 1 Financial constraints and firm growth and performance: literature review

Author(s) and year	Sample size and time period	Methodology	Main findings
Beck et al. (2005)	54 countries (1995-1999)	Panel data	The findings show that the extent to which corruption, legal and financial underdevelopment constraint firm growth is highly depended to the firm size. In other words, the smallest firms are the most adversely affected by legal and financial obstacles.
Aghion et al. (2007)	16 countries (1989-1999)	Difference-in-difference	For the case of small firms and sectors that are more relied on external finance, access to finance plays an important role in entry. This finding is consistent for other potential entry barriers.
Ayyagari et al. (2008)	82 countries (1999-2000)	Directed Acyclic Graph	The authors found that among numerous related factors, financial constraint, crime, and policy instability affect firm growth directly.
Beck and Demirguc-Kunt (2006)	-	Review paper	Reviewing the evidence of current literature shows that in most countries, SMEs have experienced more growth constraints due to less access to formal sources of finance.
Wang (2016)	119 countries (2006-2014)	Probit	The overall result verifies that limit access to finance is known as the most significant obstacle for SMEs growth.
Campello et al. (2010)	US, Europe, and Asia (2008)	Matching estimator	Firms with financial constraints planned dipper cuts in employment, capital, and technology spending.
Ayyagari et al. (2021)	22 developing countries (2004-2011)	Difference-in-difference	More access to external finance leads to higher employment growth, especially among MSMEs.
Fowowe (2017)	30 African countries (2006-2012)	Cross-sectional regression	The results show that financial constraints put a negative and significant effects on firm's growth. Furthermore, firms without financial constraints experience faster growth than ones with credit constraint.
Ferrando and Ruggieri (2018)	Seven Euro countries (1995-2011)	Ordered Probit	There is a negative and significant relationship between financial constraints and total factor productivity, especially among small, young, SMEs growth in South Eastern Europe is negatively affected by financial constraints.
Nizaeva and Coskun (2019)	South Eastern Europe (2012-2016)	Ordered Probit and FGLS	
Leitner (2016)	Western Balkan countries (2008/9-2011/12)	Panel data	Financial constraints obstruct firm growth significantly in the Western Balkan countries.

Appendix 1 Continued

Author(s) and year	Sample size and time period	Methodology	Main findings
Bottazzi et al. (2014)	Italy (2000-2003)	Panel GMM	The results show that financial constraint has negative effect on firm growth. It also face young fast-growing firms in trouble for seizing attractive growth opportunities.
Bellone et al. (2010)	France (1993-2005)	Probit and GMM	The authors found that firm's better access to financial resources may promote the probability of their export behavior.
Westhead and Storey (1997)	UK (1992-1993)	Logit	The result shows that continues financial constraints in high technology intensive firms have impeded their growth rather than less technology intensive ones.
Carpenter and Petersen (2002)	US (1980-1992)	Panel data	The result of the more than 1600 small firms shows that the growth of most firms is hindered by internal financial constraints.
Roche et al. (2021)	Australia (2006-2018)	Panel GMM	On the link between financial constraint and process innovation, the results reveal that financial constraints reduce the probability of process innovation between 10%-12%.
Egger and Kesina (2013)	China (2001-2005)	Logit	The authors found a negative relationship between financial constraints and exports.
Fagiolo and Luzzi (2006)	Italy (1992-2000)	Likelihood ratio test	Financial constraints put a negative effect on growth of smaller firms.
Silva (2011)	Portugal (1996-2003)	Propensity Score Matching with Difference in Differences	The results indicate that exporting improve the financial situation of the firms, especially in small firms.
Stucki (2014)	Switzerland (2000-2006)	Probit	Financial constraints put negative effects on firm profit. However, increase of firm age can disappear the financial constraint-survival negative nexus.
Winker (1999)	Germany (1982-1991)	Pooled Probit	The author found that the significant effect of financial constraint on investment and R&D expenditures cannot be rejected.
Becchetti and Trovato (2002)	Italy (1989-1997)	Multivariate regression	Limited access to external finance and foreign markets have potential effects on small firm survival and growth.

Appendix 1 Continued

Author(s) and year	Sample size and time period	Methodology	Main findings
Savignac (2008)	France (2000)	Probit	Financial constraints lead to a reduction in innovative activities significantly.
Sarno (2005)	Italy (1992-1997)	SURE	The results show that financial constraints limit the accumulation of working capital even when firms face with favorable market opportunities.
Megaravalli and Sampagnaro (2018)	India (2010-2014)	Quantile regression	The authors argue that better financial position of the firms leads to higher growth and reduce the chance of failure.
Donati (2016)	Italy (2001-2008)	GMM	According to the results, the growth-cash flow relationship is more sensitive for small firms rather than large ones. Furthermore, the impact of financial constraints on firms' growth in service sector is higher than others.
Hsiao and Tahmiscioglu (1997)	US (1971-1992)	Panel data	The authors found that investment of capital-intensive firms is particularly sensitive to internal funds fluctuations.
Oliveira and Fortunato (2006)	Portugal (1990-2001)	GMM	The growth-cash flow relationship is more sensitive for younger and smaller firms rather than larger and more mature firms.
Quader (2017)	UK (1981-2009)	GMM	The firm growth to cash flow is more sensitive for those kind of firms which are belonging to the most financially constrained categories.
Audretsch and Elston (2002)	Germany (1970-1986)	GMM	The investment behavior of medium-sized firms is more sensitive to financial constraint than the small and large firms.
Cheratian et al. (2024)	Iran (2019-2020)	Probit	The results suggest that financing for R&D expenditures, advertising, diversifying production, and creating new employment opportunities significantly contribute to increased sales growth. In addition, spending on intellectual property, labor training, and acquiring land and buildings has a negative moderating effect on the relationship between finance and sales growth.
Hashi (2001)	Albania (1997)	OLS	Financial constraints put a negative impact on SMEs growth, especially when they are combined with less-developed institutional environment.
Bodlaj et al. (2020)	Central and Eastern Europe (-)	Structural Equation Model	The result reveals that financial constraints have a positive impact on SMEs innovation activity rather than restrict it.