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Firms persistence under sanctions: Micro-level evidence from Iran

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Abstract

Given the importance of firm strategic management in the time of crisis, this study investigates Micro, Small and Medium Enterprises (MSMEs) approaches to persistence during the international sanctions against Iran. Using data from a questionnaire of 486 firms between December 2019 and September 2020, we found that reducing research and development (R&D) expenditures, marketing costs and fixed/overhead costs and investing in information technology (IT) are positively related to firm persistence. Conversely, managerial decisions to reduce production and cut or freeze staff pay have negative and significant impacts on a firm's ability to persist during sanctions. Moreover, micro-firms are more resilient than their small and medium counterparts. The findings also confirm that age has a significant and positive impact on firm persistence. Finally, the results show that having a business plan, access to finance and technology, owner education, export orientation, business networking and consulting services are the key drivers of withstanding pressure from sanctions.

KEYWORDS

crisis, firm, Iran, management, ordered probit, persistence, recession, sanction

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1 | INTRODUCTION

'Do Sanctions Work?' There is persuasive evidence that economic sanctions can significantly damage economic growth, disrupt trading activities and hurt the welfare of a sanctioned country (Farzanegan & Hayo, 2019; Gharibnavaz & Waschik, 2018; Jacobson, 2008; Neuenkirch & Neumeier, 2015). In response to multilateral economic sanctions, a sanctioned country establishes a range of resistant, aggressive and impermanent policies aimed at mitigating hardships in the economy. In addition, economic firms are also affected by sanctions and adopt persistent approaches to escape the grip of sanctions, reduce economic pressures and protect their profitability.

The main purpose of this study is to investigate firms' persistent approaches during the international economic sanctions against Iran. Hence, the question behind this study is: What operational strategies do Micro, Small and Medium Enterprises (MSMEs) use during sanctions to increase their chances of surviving? At the firm level, the goal is to minimise economic losses and increase resilience during sanctions. MSMEs may have advantages such as flexibility, learning capabilities, innovation and customer relations, but due to resource constraints, weaker market positioning and other factors, they may be highly vulnerable to crises (Herbane, 2010).

The Iranian economy has experienced ongoing political and economic sanctions by the United States since the Islamic revolution in 1979. In early 2012, due to the Iranian nuclear programme, the European Union and the United States imposed broad economic and energy sanctions against Iran. As Figure 1 shows, following the multilateral sanctions on transactions with Iran's Central Bank and a significant reduction in Iran's oil sales in 2012, the GDP growth rate decreased to -7.44% and the Ease of Doing Business ranking was downgraded to 152 (out of 190) in 2012. In 2018, the United States' withdrawal from the Joint Comprehensive Plan of Action (JCPOA) restored all sanctions including Iran's financial and energy sectors. Afterwards, the GDP growth rate collapsed from

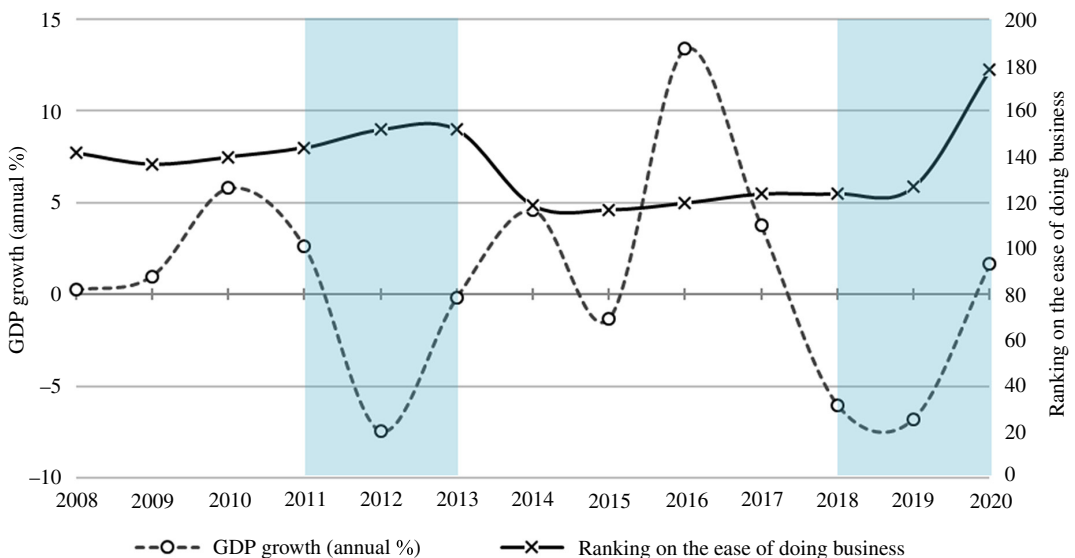


FIGURE 1 Trend of annual GDP growth rate and ease of doing business (2008–2020). *Source:* World Bank (2021) [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

13.39% in 2016 to −6.02% and −6.78% in 2018 and 2019, respectively (blue colours in Figure 1).¹ Thus, it can be found that international sanctions as a soft option may harm the Iranian economy like a war would and cause significant collateral damage to its business environment and economic welfare. In the Ease of Doing Business ranking released by the World Bank (2020), Iran is 178th, which was its worst ranking in the recent decade. Therefore, the issue for firms is no longer the effects of sanctions but the approaches to managing them.

In the case of Iran, there are several studies on how international sanctions influence the formal economy (Gharibnavaz & Waschik, 2018; Laudati & Pesaran, 2021), informal economy (Farzanegan, 2013; Farzanegan & Fischer, 2021; Farzanegan & Hayo, 2019; Zamani et al., 2021), household welfare and women employment (Demir & Tabrizi, 2022; Farzanegan et al., 2016; Khabbazan & Farzanegan, 2016), government expenditures and revenues (Dizaji, 2014; Farzanegan, 2011), militarisation (Dizaji & Farzanegan, 2020; Farzanegan, 2022), trade (Dizaji, 2019; Haidar, 2017; Shirazi et al., 2016), finance (Torbat, 2005) and firm entry (Cheratian et al., 2021). However, the case of persistent approaches of SMEs under sanctions, which was amplified in 2020 by the COVID-19 pandemic, has not yet been investigated for Iran. Our study aims to fill this gap in the literature and provide the first empirical evidence on the characteristics, which influence the persistence of firms under sanctions in Iran.

The main contribution of this study is to use a unique data set in empirical analysis that was constructed from our survey study at the Academic Center for Education, Culture and Research (ACECR) at Tarbiat Modares University (Tehran, Iran), which included a wide range of questions on different areas related to MSMEs. The survey project was also supported by Iran's Plan & Budget Organisation. The subsequent and core theoretical contribution of our study is to investigate and shed light on the effects of sanctions from the perspective of a sanctioned country. To our knowledge, this is the first study that evaluates counter-sanctions approaches, particularly for MSMEs.

Our findings suggest that firms can increase their chances of persisting through economic sanctions with the following approaches: '*reduce (or cut) marketing costs*', '*cut R&D expenditures*', '*invest in IT*' and '*reduce fixed costs/overhead costs*'. By contrast, the approaches of '*reduce production*' and '*staff pay cut/freeze*' can bring challenges that threaten a firm's persistence. Moreover, micro-firms are more resilient in crisis because of their very low scale with limited funds, limited raw materials, own sale outlets and local markets. Persistence probability decreases with SMEs, which require more equipment, tools and materials. Also, the findings confirm that firm age has a significant and positive impact on persistence, as older firms have more experience and capacities during economic hardships. Finally, the study shows that having a business plan, access to finance and technology, owner education, export orientation and access to business networking and consulting services are the key drivers of firms to withstand pressures from sanctions.

The study proceeds as follows: Section 2 reviews the theory and related literature. We explain the data in Section 3. Section 4 presents the methodology. We explain the empirical results and discussion in Sections 5 and 6, respectively. Section 7 concludes.

¹In 2015, in addition to the U.S. and EU sanctions, the price of Iranian heavy oil per barrel declined from 106 USD in 2011 to about 49 USD in 2015. This resulted in a significant decline in Iranian oil export revenues. According to OPEC (2022), the value of Iran's petroleum exports decreased from about 115 billion USD in 2011 to about 27 billion USD in 2015. It was the lowest recorded oil export revenues for Iran since 2003.



2 | MSMES IN TIME OF CRISIS: THEORY AND EVIDENCE

2.1 | Theory

During a crisis, firms are considered to adopt efficient approaches to promote their organisational capacity and persist until the postcrisis recovery period. Apart from the source of financing, firms' investment propensity tends to decrease in recession periods (Geroski & Gregg, 1997). Demand uncertainty makes firms' investment behaviour riskier than during periods of prosperity. Economic uncertainty also reduces banks' willingness to finance firms' investment projects. In this situation, smaller firms face more difficulties in financing than larger firms because of credit rationing by financial intermediates (Arvanitis & Loukis, 2020).² While many previous studies have focused on the role of a firm's characteristics, such as size (Varum & Rocha, 2012), age (Cefis & Marsili, 2005), access to finance (Carbo-Valverde et al., 2016), exporting (Lee et al., 2012), ownership education (Jarmin et al., 2014), networking (Cainelli et al., 2019) and location (Ramalho et al., 2018), this section reviews the common persistent approaches implemented by many firms in response to the negative effects of economic turbulences.

The firm's optimal reaction to a negative external shock is widely related to the nature, duration and depth of the shock, the firm's special characteristics in time of shock and the firm's product and labor market environments. A sharp reduction in demand usually leads to both production and price cuts, which depend on the degree of stickiness in prices and wages. If prices are sticky, firms are more likely to cut their production and margin in response to the shock in demand. In this situation, the extent of production and margin cuts are mostly dependent on the elasticity of demand, the firm's monopolistic market power and the firm's ability to cut costs. During an economic crisis, firms are affected by both a reduction in demand and a credit crunch. Generally, credit constraints intensify cost-cutting approaches; however, the effect on production and price is ambiguous. Firms, which tend to maximise profits, are unlikely to cut production or prices in response to a sharp decline in external financial resources. In facing a credit constraint, some firms are more likely to pressure internal and external costs in order to mitigate the cash flow limitations. The optimal cost-cutting approach is mainly dependent on the intensity and duration of the shock, as well as product and labor market constraints (Fabiani et al., 2015).

In terms of human resource management (HRM), only a few studies have investigated SMEs and large enterprises' HRM practices during crises. In the area of HRM strategy, firms may decide to reduce the size of their labor force through a combination of conducting layoffs, freezing wages and cutting benefits. However, as mentioned by Rones (1981), 'the firm ability and willingness to use layoffs is in determination of redundancy related benefit'. Regarding a large number of employees and more complex internal labor markets, large enterprises may identify more reasons to make labor force reductions. Furthermore, resource restrictions accompanied by operating in labor-intensive businesses provide SMEs more incentives to retain their employees and avoid extra recruitment costs by adopting alternative retrenchment approaches (Lai et al., 2016).

During economic hardships, some firms use pay cuts or freezes as an alternative approach to laying off employees. This approach can help business owners to avoid losing skilled labor and save costs for re-recruitment for the postcrisis recovery period (Lai et al., 2016). Comin et al. (2009)

²Some studies have focused on the importance of financial inclusion in firm promotion and how it may offset the harmful effects of economic uncertainty on firm stability (Ajide, 2020; Goel & Madan, 2019; Jiang et al., 2019). In this regard, the overall results indicate that a firm's access to a variety of financial products and services plays a vital role in enhancing firm growth (Chauvet & Jacolin, 2017; Nizam et al., 2021).

indicate that firms that have experienced instability in profitability and sales are more likely to pass along some of the turbulences to their employees, especially those with higher labor costs. However, using pay cuts approach can be a problematic approach for entrepreneurs. As Bewley (2021) indicates during economic recessions, employees' earnings may maintain downward rigidity, despite owners' resistance to pay cuts. A clear explanation of this phenomenon is related to the theory of wage rigidity developed by Solow (1979) and Akerlof (1982). Many firms (except those which experienced serious challenges in recessions) do not prefer a pay cut system as an alternative to layoffs, because cutting wages may lead to morale damage across the labor force with negative effects on work effort, ethics and the need for more supervision (Bewley, 2021).

To manage the negative effects of crises, some SMEs reduce R&D investment as a common approach to manage short-term challenges (Jung et al., 2018). However, some SMEs prefer to increase their innovative activities to establish competitive advantages for the postrecessionary periods (O'Malley et al., 2011). There are some SMEs, which implement a hybrid of the mentioned approaches (Archibugi et al., 2013). A firm's decision to choose an optimal approach highly depends on its characteristics (size, age, environment, etc.). Current evidence reveals that fast-growing, young SMEs are more likely to invest in R&D investment, whereas larger firms tend to increase efficiency through decreasing R&D investment (Latham, 2009).

Similar to cutting R&D investment approach during recessions, many firms follow the approach of decreasing spending on marketing (Greenberg, 1993). This can be a common approach to save limited resources and survive until the postcrisis recovery period (Srinivasan et al., 2005). Marketing investment has a cyclical behaviour in many firms, with the increasing trend during prosperous times and decreasing during hardships (Tubbs, 2007). Marketing is considered as an expense for many organisations and so a large percentage of marketing budgets are reduced during turbulences (O'Malley et al., 2011).

To reduce the costs of economic crisis, investment in information and communications technology (ICT) may be a potential driver of firm resilience. Firms using ICT may be able to overcome the negative shocks of economic crises by reorganising production processes easier, which can result in higher productivity and competitiveness. Firms that prolong the adoption of new technologies may face the risk of exiting the market (Bertschek et al., 2019). Along these lines, Pérez-Estébanez et al. (2018) indicate that despite a crisis, European firms consider ICT as a key component of their approach. Furthermore, small firms tend to improve their usage of ICT compared with large firms.

2.2 | Evidence

The nature and extent of the effects of crises on SMEs have become a central topic of empirical studies in recent years. Most studies mainly discuss the origins of crises and their impact on economies, industries and, in particular, entrepreneurs. There is a common belief that SMEs are the most vulnerable sector during economic crises (Latham, 2009). Due to their limited financial resources, high dependency on bank loans and paying high interest rates, SMEs may suffer performance disruptions during prolonged economic crises. In addition to financial dependency, SMEs usually face relative shortcomings in terms of managerial, human capital, market position and technological capabilities that may affect them negatively during crises (Marino et al., 2008). Unlike large firms, SMEs rely more on (fewer) customers, suppliers (Nugent & Yhee, 2002) and markets (Narjoko & Hill, 2007), which may increase the risk of failure and reduce their capacity to overcome economic hardship.

Despite these shortcomings, SMEs have some special characteristics that may help them during economic downturns. When threats or opportunities arise, SMEs may be more flexible in



adjusting processes, resource inputs, products and prices (Reid, 2007) and are more likely to pursue growth-oriented strategies (Latham, 2009). During economic downturns, SMEs are less resistant to inertia, rigidity and sunk costs (Tan & See, 2004) and also rely less on formal credits, compared with large enterprises, which are burdened by more debts (Ter Wengel & Rodriguez, 2006). Because of their smaller size, SME decision-makers are closer to their customers and other stockholders who can provide them with valuable market information in reacting to crises (Eggers et al., 2012).

In order to shed more light on the effects of crises on SMEs, Appendix A shows the relevant studies divided by geographical scope, time period, type of crisis (with focus on economic and financial sectors), methodology and main findings. As the results show, most studies cover the impacts of the 2007–2008 global financial crisis on SMEs performance, focusing on European countries. However, some studies have focused on developing economies (see Marino et al., 2008). In this area, a series of studies have investigated changes in the financial indicators of SMEs (profitability, leverage, debt ratio, liquidity and asset structure) in response to the crisis (see Bussoli & Marino, 2018; D'Amato, 2019; Kim et al., 2015; Yazdanfar et al., 2019). Some other studies have investigated the difference in such financial indicators between old and young SMEs (see Serrasqueiro et al., 2018) or SMEs and their large counterparts (Kudlyak & Sanchez, 2017).

In the field of strategic management, several studies have indicated the role of entrepreneurial orientation (EO) and market orientation (MO) during economic downturns. Regarding this, SMEs with an EO viewpoint may have benefited from innovativeness, proactiveness and consequently, the willingness to take risks, which may help them to have better chances of persistence during and after a crisis (Covin & Lumpkin, 2011). Related studies also show the positive effects of MO and a combination of EO and MO on SMEs performance during times of crisis (Beliaeva et al., 2020).

Crises may not just be due to economic or financial hazards, natural and environmental disasters may also affect entrepreneurial activities. Regarding the current evidence, natural crises substantially damage the process of entrepreneurial activities and make it difficult for entrepreneurs to return to their normal operations (Grube & Storr, 2018). Therefore, due to the large scale of production networks, firms' productivity may diminish in the aftermath of a crisis (Carvalho et al., 2021). Since 2019, significant attention is given to the COVID-19 pandemic and its effects on SMEs persistence (Brown & Cowling, 2021), SMEs access to finance (Brown et al., 2020), SMEs strategic management (Castro & Zermelo, 2020), SMEs formation (Haltiwanger, 2021) and public policy initiatives (Groenewegen et al., 2021).

Review of the current literature shows that previous studies have mainly focused on the financial aspects of European SMEs during the 2007–08 global financial crisis with less attention devoted to the SMEs in developing economies. Over the last 2 years, a new strand of studies has discussed the impacts of the COVID-19 crisis on SMEs and how it will change the way of life and work. However, to the best of our knowledge, there is a lack of studies on the effects of international sanctions on the SMEs sector in sanctioned countries.

3 | DATA

3.1 | Sample

The data for this study is collected through surveys conducted from December 2019 to September 2020 by the Academic Center for Education, Culture and Research (ACECR) by using a in-person

questionnaire.³ This survey covers information for Micro, Small and Medium Enterprises (firms between 1 and 49 employees) in Iran when the U.S. withdrew from the JCPOA and sanctions returned with greater intensity in 2018. To do so, 486 MSMEs from 5 provinces in Iran have been identified as a sample. In selecting the provinces, in addition to the geographical distribution, the level of development in the provinces is also taken into account so that two provinces with higher levels of development (Tehran and Khorasan Razavi), two provinces with medium levels of development (Mazandaran and Kerman) and one province with a lower level of development (Ilam) are selected from the five geographical regions (North, South, East, West and Center).

Owners and senior managers of business enterprises were interviewed as a unit of observation and the number of sample firms in each province was weighted to take into account unequal probabilities of selection in the survey. The survey covers a vast range of topics related to Micro, Small and Medium Enterprises. The themes include intra-organisational goals and values, financing, business environment, sanctions, persistence and marketing, education and skills, job creation and labor adjustment, government laws and administrative bureaucracy, export and competitiveness, computers, internet and websites, networking and business consulting and information. For conducting interviews and completing questionnaires, the interviewers were faced with COVID-19 restrictions and public closures, so each firm was only visited once and the interviews were conducted just with the employer or manager of the firm in order to generate a robust questionnaire. The key characteristics of the collected survey are listed in Table 1.

3.2 | Dependent variable

First part of Table 2 shows the definition of the dependent variables, which capture the effects of sanctions on businesses. The firm's managers were asked to specify: 'How have sanctions affected your business?' The response variable has three categories: 'It has caused a boom', 'It has caused a recession' and 'It has been ineffective'.

TABLE 1 Survey of technical data

	Tehran	Mazandaran	Ilam	Kerman	Khorasan Razavi	Total
Firms ^a	5576	1850	259	1780	2621	12,086
Sampling	159	99	29	100	99	486
Size						
Micro (1–9)	65	31	15	34	50	195
Small and Medium (10–49)	94	68	14	66	49	291
Age						
Less than 5 years old	22	27	8	27	21	115
6–10 years old	41	29	9	30	22	131
11 years old and more	86	43	12	43	56	240

^aTotal registered firms in each province.

³A background on this project is available at the website of the ACECR: <http://ergtm.acecr.ac.ir/fa/news/41121> (in Persian).



TABLE 2 Descriptive statistics

Name	Explanation	Mean	SD	Min.	Max.
Dependent variable					
Effects of sanctions on firm	0—It has caused a boom; 1—It has caused a recession; and 2—It has been ineffective	1.04	0.49	0	2
Independent variable					
Persistent approaches					
Reduce (or cut) marketing costs	0—very low; 1—low; 2—medium; 3—high; and 4—very high	1.60	1.27	0	4
Cut R&D expenditures	0—very low; 1—low; 2—medium; 3—high; and 4—very high	1.65	1.25	0	4
Invest in IT	0—very low; 1—low; 2—medium; 3—high; and 4—very high	1.47	1.27	0	4
Reduce fixed costs/overhead costs	0—very low; 1—low; 2—medium; 3—high; and 4—very high	2.19	1.34	0	4
Reduce production	0—very low; 1—low; 2—medium; 3—high; and 4—very high	1.68	1.37	0	4
Reduce the number of employees	0—very low; 1—low; 2—medium; 3—high; and 4—very high	1.55	1.33	0	4
Staff pay cut/freeze	0—very low; 1—low; 2—medium; 3—high; and 4—very high	1.06	1.19	0	4
Firm characteristics					
Size—Micro	1—if number of firm's employees between 1 and 9; 0—otherwise	0.40	0.49	0	1
Size—Small and Medium	1—if number of firm's employees between 10 and 49; 0—otherwise	0.54	0.49	0	1
Age—Less than 5 years old	1—if age of firm <5 years old; 0—otherwise	0.23	0.42	0	1
Age—6–10 years old	1—if age of firm between 6 and 10 years old; 0—otherwise	0.23	0.42	0	1
Age—11 years old and more	1—if age of firm 11 years old and more; 0—otherwise	0.49	0.50	0	1
Business plan	1—if firm have a business plan; 0—otherwise	0.65	0.47	0	1
Apply for finance	1—if firm applying finance in the past 12 months; 0—otherwise	0.41	0.49	0	1
Access to technology	1—if firm access to required technology or infrastructures; 0—otherwise	0.65	0.47	0	1
Owner Education	1—if the business owner has university degree; 0—otherwise	0.65	0.47	0	1
Export Orientation	1—if firm has export to international markets; 0—otherwise	0.19	0.39	0	1
Business networking	1—if firm linked to business networks; 0—otherwise	0.60	0.48	0	1
Access to consulting services	1—if firm applying consulting services in the past 12 months; 0—otherwise	0.50	0.50	0	1
Location characteristics					

TABLE 2 (Continued)

Name	Explanation	Mean	SD	Min.	Max.
Tehran	1—if firm is located in Tehran province; 0—otherwise	0.32	0.46	0	1
Mazandaran	1—if firm is located in Mazandaran province; 0—otherwise	0.20	0.40	0	1
Ilam	1—if firm is located in Ilam province; 0—otherwise	0.05	0.23	0	1
Kerman	1—if firm is located in Kerman province; 0—otherwise	0.20	0.40	0	1
Khorasan Razavi	1—if firm is located in Khorasan Razavi province; 0—otherwise	0.20	0.40	0	1

3.3 | Explanatory variables

Independent variables in this study can be classified into persistent approaches and firm and location characteristics. Due to the importance of persistent approaches, the data were recorded on a Likert scale, ranging from zero being ‘very low’ to four being ‘very high’. The persistent approaches, respectively, consist of: ‘*Reduce (or cut) marketing costs*’, ‘*Cut R&D expenditures*’, ‘*Invest in IT*’, ‘*Reduce fixed costs/overhead costs*’, ‘*Reduce production*’, ‘*Reduce the number of employees*’ and ‘*Staff pay cut/freeze*’.

The firm and location characteristics are included in the model to control for the possible contextual effect. The firm characteristics include size, age, business plan, demand for finance, access to technology, owner education, export orientation, business networking and demand for consulting services. Firm size is measured by employment numbers that are divided into two groups. Firm age is reported in three categories, including less than 5 years old, 6–10 years old and 11 years old and more. Variables on the business plan, demand for finance, access to technology, owner education, export orientation, business networking and demand for consulting services are defined as binary variables, 1 if the answer to the question is a ‘yes’, 0 otherwise.

The business plan indicator measures the credit support for the firm's application. Demand for finance is defined as whether the firm owners reported having applied for financing for their businesses in the previous 12 months. In addition, access of firms to required technology or infrastructures has been included. Owner education is an indicator for the formal educational qualification, measured if the owner has a university degree or higher. The export orientation variable indicates if the firm exports its products to international markets. The proxy of business networking provides information about cross-firm convergence and its link to business networks. Finally, we include demand for consulting services to see whether professional firm managers have used consulting services in the past 12 months.⁴ We use five location characteristics: Tehran, Mazandaran, Ilam, Kerman and Khorasan Razavi. About 33% of the firms is in Tehran, 20% each in Mazandaran, Kerman and Khorasan Razavi, and about 7% of the sample firms is located in Ilam. The overall sample size is 486.

⁴For more details, see Panel B of Table 2.



3.4 | Descriptive statistics

Table 2 reports the descriptive statistics of the dependent and independent variables. The mean of effects of sanctions on firms is 1.04, which means that the sanctions caused a recession for most of the enterprises. Amongst persistent approaches, 'Reduce fixed costs/overhead costs' has the highest mean value, about 2.19, which shows that reducing fixed costs and/or overhead costs is the most important approach for the firms to persist during the sanctions. By contrast, the persistent approach of 'Staff pay cut/freeze' has the least importance in the face of sanctions, from the firm's perspective, about 1.06.

4 | METHODOLOGY

The primary objective of this study is to investigate the managerial decision-making process to persist during sanctions. We use weighted ordered probit estimations. Given that the dependent variable is an ordered categorical variable, ordered probit is a more appropriate econometric method than linear regression since it does not impose the assumption that all adjacent responses are equidistant (Long & Long, 1997). The usage of a weighted ordered probit model exploits the ranking information included in the scaled dependent variable of the effects of sanctions. Weights are assigned based on firm two-digit International Standard Industrial Classification (ISIC) industry codes. Weights are proportional to the inverse of the probability of being sampled. In fact, the usage of weights enables us to obtain representative results without the influence of a specific industry with large sample size (Tomohara & Ohno, 2013).

We use a weighted ordered probit model where s^* is an unobserved latent variable of sanction effects to firm S , and x is expressed as a linear combination of factors that affect s^* , together with an error term, ε , which is independent of x and has the standard normal distribution as $s^* = x\beta + \varepsilon$. The firm's managers were asked to specify: 'How have sanctions affected your business?'. Responses are given on three-point scale from level '0. It has caused a boom', '1. It has caused a recession' to '2. It has been ineffective'.

The probability of s is expressed as follows:

$$P(s = j|x) = F(\varphi_j - x\beta) - F(\varphi_{j-1} - x\beta), j = 0, 1, 2, \quad (1)$$

where F is the cumulative distribution function of ε and an observation for the sanction effects is defined as $s = j$ if $\varphi_{j-1} < s^* \leq \varphi_j$ and $\varphi_0 = -\infty$ and $\varphi_2 = +\infty$ (Tomohara & Ohno, 2013).

However, as in the ordered probit estimation, the equation has a nonlinear form and only the sign of the coefficient can be directly interpreted and not its size. In order to provide a better interpretation of the ordered probit coefficients, average marginal effects are estimated (Brown et al., 2009). Suppose that there are three categories as our dependent variable, the responding extent of the marginal effects from every independent variable could be presented as Greene (2012) shows:

$$\begin{aligned} \partial \text{Prob}(y = 0) / \partial x &= -\varphi(x'\beta)\beta \\ \partial \text{Prob}(y = 1) / \partial x &= [\varphi(-x'\beta) - \varphi(\mu - x'\beta)]\beta \\ \frac{\partial \text{Prob}(y = 2)}{\partial x} &= \varphi(\mu - x'\beta)\beta \end{aligned} \quad (2)$$

where μ is an estimated threshold parameter and φ is the standard normal density. The β coefficient was measured to identify the importance of each of the independent variables on the probability of sanction effects. Notice that the sum of the marginal effects equals zero, therefore the signs on the marginal effects do not remain constant. One-unit increase in the independent variable (x), shifts the distribution slightly to the right and if we assume that β is positive, $Prob(y = 0|x.\beta.\mu)$ will decline. It means that $Prob(y = 0: \text{sanctions cause a boom})$ has the opposite sign of β at the lowest ordered level. By contrast, the signs of β for $Prob(y = 2: \text{sanctions have been ineffective})$ at the highest ordered level remains unchanged. Greene (2012) illustrated that for the middle event probability, we need to examine the signs. Thus, the signs of β for $Prob(y = 1: \text{Sanctions cause a recession})$ are ambiguous.

5 | EMPIRICAL RESULTS

The results of the relationship between a firm's persistent approaches and the effectiveness of sanctions are shown in Table 3. Since sanction effectiveness is reported as an ordinal variable, an ordered probit model is adopted. In order to provide a better interpretation of the obtained coefficients, the average marginal effect for 'sanctions have been ineffective' (outcome 2) is presented, which explains the probability of the ineffectiveness of sanctions. When the dependent variable is ordered, the estimated parameters do not reflect a unit change of an independent variable on probability; thus, the estimated coefficients in an ordered probit have no direct interpretation. The information in Table 3 is organised into three columns. According to Frey and Stutzer (2000) and Torgler (2004), the least squares estimation measures the dependent variable as a cardinal variable. Thus, as a further robustness check, we replicate our estimates using weighted least squares regression that can be seen in Table 3. The last column contains the average marginal effects on the probability that sanctions have been ineffective for a unit change in the independent variables.

We use the main marginal effect (outcome 2) of the estimated variables after the ordered probit model to discuss the results in this section. Table 3 reports the detailed distribution of our measures of firm persistent approaches. As shown, the model is significant and all the parameters of approaches except for '*reduce the number of employees*' are statistically significant. The coefficients for four of the seven approaches are positive and two are negative. The weighted ordered probit regression from testing the log-likelihood was -8963.55 and the χ^2 was 1095.36 , with the model significance level at $p = .000$.

Inspection of Table 3 indicates that the coefficient for the approach of '*Reduce (or cut) marketing costs*' is significant and positive at the 1% level. That means that the approach has a positive impact on the firm's persistence during the sanctions. A one-unit increase in the importance of this approach by the responding firms is associated, on average, with 0.8 percentage point (pp) higher probability of the ineffectiveness of sanctions or persistence during sanctions, controlling for other factors. Also, the results associated with '*Cut R&D expenditures*' approach indicate that the marginal effect is statistically significant and positive, but the magnitude of the effect is small. A one-unit increase in the importance of this approach by the surveyed firms is associated, on average, with approximately 0.4 pp higher likelihood of the ineffectiveness of sanctions. Moreover, a one-unit increase in the importance of investing in IT is associated with an average increase of 0.5 pp in the probability of the ineffectiveness of sanctions for the surveyed firms.

The results in Table 3 indicate that the last and largest positive coefficient for the approaches is related to '*Reduce fixed costs/overhead costs*'. A one-unit increase in the importance of this approach is associated with an average increase of 1.77 pp in the probability of the ineffectiveness of sanctions.



TABLE 3 Estimation results

Explanatory variable	Weighted least square		Weighted ordered probit		Average marginal effects
	β	SE	β	SE	dy/dx (percentage point)
Persistent approaches					
Reduce (or cut) marketing costs	0.015***	(0.003)	0.038***	(0.009)	0.8***
Cut R&D expenditures	0.007**	(0.003)	0.021**	(0.009)	0.4**
Invest in IT	0.008**	(0.003)	0.025***	(0.009)	0.5***
Reduce fixed costs/overhead costs	0.032***	(0.003)	0.081***	(0.009)	1.7***
Reduce production	−0.015***	(0.004)	−0.037***	(0.011)	−0.8***
Reduce the number of employees	−0.003	(0.004)	−0.004	(0.011)	−0.0
Staff pay cut/freeze	−0.058***	(0.004)	−0.148***	(0.011)	−3.2***
Firm characteristics					
Size—Micro	0.126***	(0.022)	0.311***	(0.056)	7.1***
Size—Small and Medium	−0.043**	(0.020)	−0.120**	(0.053)	−2.6**
Age—Less than 5 years old	−0.046*	(0.025)	−0.108*	(0.065)	−2.3*
Age—6–10 years old	0.103***	(0.025)	0.274***	(0.064)	6.4***
Age—11 years old and more	0.061**	(0.024)	0.169***	(0.062)	3.7***
Business plan	0.035***	(0.010)	0.090***	(0.025)	1.9***
Apply for finance	0.127***	(0.009)	0.321***	(0.024)	7.3***
Access to technology	0.024**	(0.009)	0.065***	(0.024)	1.4***
Owner Education	0.034***	(0.010)	0.083***	(0.027)	1.8***
Export Orientation	0.063***	(0.011)	0.159***	(0.028)	3.6***
Business networking	0.023**	(0.009)	0.053**	(0.024)	1.1***
Demand for consulting services	0.079***	(0.025)	0.200***	(0.023)	4.4***
Location characteristics					
Tehran	0.756***	(0.035)	−0.215***	(0.033)	−4.5***
Mazandaran	0.747***	(0.038)	−0.242***	(0.038)	−4.9***
Ilam	0.649***	(0.041)	−0.499***	(0.055)	−8.5***
Kerman	0.817***	(0.037)	−0.063*	(0.036)	−1.3*
Kh.Razavi	0.841***	(0.036)	—	—	—
Number of observations	486				
LL test	−8963.55				
LR chi ²	1095.36				
Prob > chi ²	(0.000)				
Pseudo R ²	0.057				
R ²	0.824				
F-statistics	2470.64				

TABLE 3 (Continued)

Explanatory variable	Weighted least square		Weighted ordered probit		Average marginal effects
	β	SE	β	SE	dy/dx (percentage point)
Prob. > F	(0.000)				
Weights	2-digit ISIC		2-digit ISIC		

Note: ‘–’ means omitted because of collinearity. The average marginal effects are for the probability of ‘sanctions have been ineffective’.

*** $p < .01$, ** $p < .05$ and * $p < .1$.

Additionally, the results for firm persistent approaches during the sanctions showed that the signs of the coefficients of ‘Reduce production’ and ‘Staff pay cut/freeze’ approaches are negative and statistically significant and are, respectively, about -0.8 pp and -3.2 pp. The coefficients confirm that the increasing importance of reducing production and cutting/freezing staff pay is, on average, associated with a lower probability of the ineffectiveness of sanctions for them. These two approaches undermine the persistence of firms under sanctions.

Furthermore, Table 3 illustrates the effects of various firm characteristics as control variables. The results of the weighted ordered probit model confirm that the coefficients of size and age are significant and vary for different sub-categories, whereas the signs of the coefficients of business plan, apply for finance, access to technology, owner education, export orientation, business networking and access to consulting service variables are positive and statistically significant at the 1% level. Average marginal effects on the binary variables are shown as well. A firm that applied for finance and accessed to loans will increase the probability of the ineffectiveness of sanctions by 7.3 pp, and a firm that uses consulting services will increase the probability of persistence by 4.4 pp.⁵ Furthermore, we have included additional control variables regarding the location of firms. Finally, the signs and statistical significance of coefficients are the same in models, which are based on the weighted least square method.

6 | DISCUSSION

In terms of how firms can persist under sanctions, we find that even during a recession, there are some approaches that many firms follow to counter the sanctions. The most important approach for firms during sanctions is not to freeze or reduce staff pay. Our result is in line with the findings of Bewley (2021) that pay cuts were not preferred by many firms as nominal wage cuts damage morale across the workforce and may raise labor monitoring costs, reduce labor efficiency and firm productivity. The second most important persistent approach for firms under sanctions is reducing fixed and overhead costs. This suggests that the ‘Reduction of fixed costs/overhead costs’ can positively influence the degree of scale economies in a firm, which is an important factor in persistence (Audretsch, 1995). Moreover, smaller firms have the advantage of low overhead costs and can improve their cost efficiency during the recession period by controlling overhead costs (Mahmood, 2000).

⁵A complete set of calculations of these values is available upon request.



Our analysis shows that firms should reduce their marketing costs to persist. Indeed, for many firms, marketing and advertising expenditures are considered as marginal expenses (Danaher & Rust, 1994) that are negatively affected by the crisis (Navarro, 2009) and reducing them may enhance the firm's short-term earnings. According to our results, decreasing production is another approach that firms should avoid. The results imply that a decrease in firm production during a crisis would entail a loss of competitiveness and market share and consequently, negatively impact the firm's cash flow and future production (Argyres et al., 2019). Hence, reducing production is a threat to the firm's persistence and weakens the firm's capabilities during sanctions. Consistent with Ravichandran et al. (2005), the results provide some support for the use of IT capabilities, helping firms in terms of flexibility and adaptability. Moreover, it is beneficial for the sustainable competitive advantage, which leads to firm persistence and success. Finally, according to Behboudi et al. (2013), the average share of R&D expenditures in GDP in Iran during recent years was below 1%. This suggests that economies with natural resource abundance, such as Iran, are labor-intensive in their industries, especially for MSMEs. The larger exporting enterprises are more productive, skilled and capital-intensive in Iran (Rasekhi et al., 2019), but MSMEs are focused on local markets and are not export-oriented, as the share of R&D was about 0.2% in the manufacture's value-added (Farjadi et al., 2018). Therefore, MSMEs are less suffering for cutting R&D expenditures. Hence, the least important approach that can help the firms to persist during sanctions is cutting R&D expenditures.

We employed various specifications of the size and age variables. There is a strong size and age effect in that smaller and older firms are more resilient during periods of economic hardship. The positive and significant coefficient of micro-firms suggests that they are more localised businesses that sought lower amounts of external finance, have very limited exporting activities (Cowling et al., 2021) and are more resilient than larger firms. Also, the measured coefficients for the older groups of firms (6 years old and more) have the same sign and significance as above. Most of the difference between older and younger firms is their experience during economic hardships. Chang et al. (2002) argue that older firms may benefit from their greater business experience than their younger counterparts, which reflects the impact of the accumulated learning-by-doing. Thus, older firms in Iran, through experimentation, learned how to withstand sanctions.

Moreover, our findings reinforce the evidence that firm characteristics are effective factors during sanctions. In Table 3, firms that had business plans are more likely to resist the negative effects of the sanctions. The existence of a business plan has a large impact on the rate of business start-ups, persistence of existing firms, employment, profits and sales of firms (McKenzie, 2017). On the other hand, managerial decisions to apply for finance and the firm's ability to access finance have a strictly positive and significant effect on a firm's persistence during sanctions that are in line with Cowling et al. (2016). Also, we find evidence that access to technology improves firm performance in terms of resistance against the negative influences of the sanctions. It has been accepted that accessing and utilising technology can create a sustainable competitive advantage for firms (Sakas et al., 2014). The results for owner education indicate that there is a significant and positive association between the owner's level of education and the success of MSMEs during the crisis. This finding is consistent with the study of Doms et al. (2010), where owner education is positively correlated with a variety of outcomes used to measure firm performance. Also, higher educated business owners are more likely to employ an educated local labor force, which might help firms to be more successful.

We found that export orientation is a highly positive and significant determinant of firm persistence during the period of crisis in Iran. The main sales by Iranian MSMEs are at local market, and the export destinations of the few exporting firms are to neighbouring countries like Iraq, Syria and Afghanistan. Moreover, economic sanctions will cause Iran's national currency, the rial, to depreciate

(Ghorbani Dastgerdi et al., 2018). This depreciation decreases the price of exported goods and increases the price of imported goods so export-oriented industries will benefit. Narjoko and Hill (2007) investigate firm persistence during the 1997/1998 Indonesian crisis and find export orientation to be a highly significant determinant of both persistence and recovery. In line with prior research (Hite & Hesterly, 2001), Table 3 documents that business networking is beneficial for MSMEs in Iran during the imposed sanctions. A firm's network can be an important source of knowledge and competitive advantage (Dyer & Singh, 1998) that increases the firm's chance of persistence (Schoonjans et al., 2013). In addition, SMEs can benefit from economies of scale without having the disadvantages of being large scale (Watson, 2007). In terms of access to consulting services, we find that consulting had a positive and significant impact on the ability of MSMEs to withstand economic sanctions. Bruhn et al. (2018) noted that consulting intervention had a positive impact on the productivity of enterprises and could help cope better with the 2008 economic crisis. Firms that are less well-trained might experience economic shocks more passively and do not have the tools to counteract a shortfall in demand.

Magnitudes of the marginal effects are relatively higher for the firm characteristics than for firm persistence approaches. Firm characteristic variables in our database are defined as dummy variables, thus a move from 0 to 1 is a more substantial development, which then increases or decreases the probability of the ineffectiveness of sanctions. However, the firm's management approaches are defined from 0 (very low level of importance) to 4 (very high level of importance) and each unit increase means a smaller change and thus shows a smaller average marginal effect.

Finally, we may wonder whether the sanctions signify a structural change in the Iranian economy. This may depend on the temporary or permanent imposition of sanctions and how firms perceive them. In the case of Iran, there are no clear cut 'sanctions on' and 'sanctions off' periods (as is mentioned by Laudati & Pesaran, 2021). In other words, there is neither a permanent nor temporary sanction status. Since the Islamic revolution in 1979, the Iranian economy has been under different types of unilateral and multilateral sanctions. Their intensity, however, has been different. The most important are economic sanctions, imposed as a result of its nuclear programme by the UN, U.S. and EU from 2012 to 2015 and have substantially affected its economy. Between 2016 and 2017, the sanctions related to the nuclear programme were lifted as a result of a nuclear deal between Iran and other engaged partners. The Trump administration reimposed the sanctions in 2018. Currently, the negotiations between Iran and other interested groups are in progress for reaching a new deal and the possible lifting of sanctions.

In short, economic agents in Iran are learning to live with sanctions and thus trying to learn from the lessons of past experiences. During sanctions, the government also tries to increase the share of tax revenues (due to the decrease in oil exports due to sanctions) and thus is more engaged in tax reforms and managing the shadow economy and tax evasion (which has proven to be a demanding political task, see Ishak & Farzanegan, 2020, 2022). The incentive to reform the subsidies is also higher during the imposed sanctions. Such pressure to reform reduces during boom periods following the lifting of sanctions because the reforms may have also political consequences in oil-rich autocratic systems such as Iran. Thus, we can think about reforms in political and economic institutions during sanctions as temporary and do not translate to sustainable reform.

The lost income for Iran under sanctions is significant, but sanctions can also act as exogenous pressure on firms for seeking resilience through innovation. With the likelihood of lifting sanctions and conducting a new survey, we may obtain new insights on possible changes in firm behaviour in the funding of their projects or allocation of their resources.



7 | CONCLUSION AND POLICY RECOMMENDATIONS

This research explores how Micro, Small and Medium Enterprises (MSMEs) in Iran have functioned in a sanctioned economy. The ‘maximum pressure’ campaign by the Donald Trump administration from 2018–2020 aimed to change the political behaviour of the Iranian government by increasing economic burdens. There is a growing number of studies, which have looked at macroeconomic indicators under sanctions. However, how firms at the micro-level react to sanctions and which factors are responsible for their persistence are unexplored fields in Iran. Our study addresses this gap in the literature.

Using a novel data set based on a survey of a large number of MSMEs regarding their approach in response to the 2019 and 2020 sanctions and employing weighted ordered probit regression, we shed more light on the dynamics of business under sanctions in Iran.

The findings show that under persistent approaches, reducing marketing, fixed/overhead and R&D costs and increased investment in information technology increase the persistence of firms under sanctions. In other words, these approaches show relevant effects in making sanctions ineffective. However, approaches such as reducing production levels and cut or freeze staff pay reduce the persistence of firms. They do not help firms to become resilient against sanctions. Firm characteristics that positively impact persistence are having a business plan, access to finance and technology, owner education, export orientation and access to business networking. Finally, our results show that micro-firms are more resistant to the negative effects of the sanctions.

Interesting policy implications can be drawn from the results. As the extensive discussion shows, policymakers can implement policies to support domestic production by applying lower advertising tariffs for domestic businesses in the media (newspapers and television). Moreover, business managers may have strong incentives to opportunistically cut R&D expenditures in order to save more costs. Our view, however, is that authorities can encourage businesses to invest in IT and provide low-cost services in areas like ‘Empowerment System’ in the Ministry of Communications and Information Technology of Iran, which was launched to provide bank loans for a maximum period of 30 days with low interest rates and a one-year delay for loan repayment. In particular, the evidence gathered in our study suggests that businesses take an integrated approach in reducing fixed and overhead costs. This can be achieved by receiving discounts on employee insurance costs and premiums paid to social security and pension organisations. In addition, the reduction in union fees and tax rates as well as increasing energy and raw material efficiency can help a lot in this regard.

Furthermore, we argue that supportive policies could be implemented to stabilise production and remove barriers so that firms do not reduce their production during sanctions. One of the challenges for MSMEs is the lack of working capital and access to financing, which the diversification of financing methods and accurate identification of production priorities can address. Another obstacle to production in Iran is the multiplicity of laws in the industrial sector and thus it is necessary to amend laws in this area. In addition, incentive policies can be implemented for firms that retain their workforce and do not freeze pay. For example, the insurance company can pay the unpaid wages of labor instead of the employer within a certain period. Also, allocating bank loans to firms that do not lay off workers would be particularly useful policy in this area, which was implemented during the COVID-19 pandemic in Iran. Policies like these allow businesses to prioritise regular payroll and labor retention. In the above-mentioned analysis, it should be noted that according to the results, these proposed approaches should be more carefully and sensitively implemented in small and medium enterprises, as well as young enterprises, because these groups are more vulnerable to pressures under sanctions.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon request.

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APPENDIX A

The impact of economic and financial crisis on SMEs: Review of related studies

Author(s) and year	Sample size and time period	Methodology	Type of crisis	Main findings
Varum and Rocha (2013)	Portugal (1988–2007)	Panel data	Economic	The results show that the negative effect of economic downturns on large firms is higher than on SMEs. However large firms can recover more quickly
Peric and Vitezic (2016)	Croatia (2008–2013)	Two-step dynamic panel	Economic	The Authors found that during the economic recession, the potential for growth in large and medium-sized enterprises is more than small ones. Furthermore, small firms have shown less vulnerability to job destruction compared with their medium and large counterparts
Lee et al. (2015)	UK (2007/8–2010/12)	Probit regression	Financial	During the financial crisis, innovative UK firms had a harder situation in accessing finance than other firms
Cowling et al. (2018)	UK (2010)	OLS and Quantile	Financial	Regarding the severity of the crisis, entrepreneurs' previous experiences had substantive effects on small business performance. However, young small firms grew faster on average than their older counterparts
Forbes (2002)	Around the world (1997–1999)	Panel data	Currency	During large depreciations, the performance of larger firms is usually worse than smaller firms, although the robustness of this result changes across different specifications
Lawless et al. (2015)	Ireland (2003–2014)	Ordered probit regression	Financial	The results show the negative effects of debt burdens on firm performance (such as investment and employment). Although, the crisis has the greatest effect on enterprises and sectors, which rely on domestic demand and were in the mild-lifecycle
Simón-Moya et al. (2016)	Valencia (2000–2005)	Binary logistic regression	Economic	The authors found that during crises, entrepreneurs have a greater likelihood of surviving compared with growth periods. Furthermore, the gaps of surviving between opportunity and necessity entrepreneurship are bigger in crisis times rather than in growth periods
Cowling et al. (2015)	UK (2007–2008)	OLS and Probit regression	Financial	During the recession, about 40 percent of SMEs experienced a fall in employment and 50 percent experienced a fall in sales. However, within 12 months of the recession about 75 percent of firms had a desire to grow

Author(s) and year	Sample size and time period	Methodology	Type of crisis	Main findings
Marino et al. (2008)	Indonesia (1997)	OLS	Financial	The results show that firms' responses on financial crisis varied based on whether the shocks have permanent or temporary impacts on the industries
Carbo-Valverde et al. (2016)	Spain (1994–2006)	Switching regression model	Financial	Credit-constrained small and medium firms depend on trade credit, and during the financial crisis, the intensity of this dependence increased. By contrast, unconstrained firms, are dependent on bank loans rather than trade credit
D'Amato (2019)	Italy (2006–2016)	Panel data	Financial	Due to the negative shocks to credit supply, SMEs leverage (especially short-term debt exposure) significantly decreased during and after the 2007–08 financial crisis
Kudlyak and Sanchez (2017)	US (1958–2009)	Gertler and Gilchrist (1994)	Financial	The authors show that during 2007–09 financial crisis, low financially-dependent firms suffered more than high financially-dependent firms. These results favour the view that a tightening of financial or collateral constraints might not be a good representation of the 2007–09 crisis
Zubair et al. (2020)	Netherlands (2004–2012)	Panel fixed effect	Financial	During and after the 2007–2008 financial crisis, investment by private SMEs declined significantly. Furthermore, borrowing from banks was critical in determining the private enterprises investment during the crisis period
Yazdanfar et al. (2019)	Sweden (2008–2015)	OLS and GMM	Financial	During the crisis, Swedish SMEs rely more on short- and long-term debt than after the crisis period. Moreover, some internal and external factors (such as profitability, size, financial crisis, tangibility and industry affiliation) explain the changes in SMEs short- and long-term debt ratios
Kim et al. (2015)	Korea (1994–1999)	Panel fixed effect	Financial	Regarding the large exchange rate depreciation during the 1997–98 crisis, SMEs with more short-term foreign debt experienced larger declines in sales and were more likely to declare bankruptcy
Bussoli and Marino (2018)	Europe (2005–2013)	GMM	Financial	SMEs use trade credit more extensively when they face a high probability of insolvency. Weaker and distressed firms are less able to match their revenues to their costs. Finally, the results show that the substitution hypothesis is weakened and liquidity shocks are propagated through trade credit channels during financial crises

(Continues)

Author(s) and year	Sample size and time period	Methodology	Type of crisis	Main findings
Cornille et al. (2019)	Europe (2014)	OLS	Financial	Credit constraint mainly affects SMEs borrowing money from financially less healthy banks during the precrisis period and, in turn, had to adjust their labor input downwards than precrisis clients of healthier banks
Barron et al. (2012)	France, Sweden and the UK(2009)	Kruskal–Wallis H test	Financial	The monitoring of political initiatives by small and medium enterprises in response to the recession varied in accordance with the extent to which their countries are affected by the recession. Also, small business managers, on the whole, considered it more important, despite the international nature of the crisis, to monitor political responses in national rather than supranational political settings
Castellani (2018)	Italy (2007–2014)	GMM	Financial and economic	During the financial crisis, bank securitisation has not directly affected the supply of new SMEs loans
Beliaeva et al. (2020)	Russia (2015–2016)	Hierarchical OLS	Economic	The results show a positive and significant effect of entrepreneurial orientation and a nonsignificant effect of market orientation during the economic crisis
Eggers and Kraus (2011)	Silicon Valley (2009)	Interview	Economic	The authors found that the interplay of entrepreneurial orientation and customers constitutes the discipline of entrepreneurial marketing. However, entrepreneurial marketing orientation requires at least a certain amount of resources—a challenge in hard economic times