Inside out: The interplay between institutions and digital technologies for SMEs performance

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Abstract: An effective digital strategy provides multifaceted benefits for firms of all sizes, including operational oversight, learning, and effective market interactions. Yet, despite the burgeoning evidence that digitalization provides essential resources for firms, disparate observations on the link between SME performance and digitalization across regions are noted in the literature. There remain concerns about whether SMEs enact effective digital strategies to reap the rewards, especially given that some SMEs have reported entirely forgoing digital activities due to resource constraints and exogenous forces in the market. In light of the varying global observations, it is crucial to understand how regional and multi-layered institutional settings influence SMEs to adopt, implement, and utilise digital resources to form solid policies and appropriate facilitative mechanisms. Therefore, this study compiled 11,485 observations of SME digital activities and performance from 88 distinctive institutional regions within Latin America and the Caribbean from 2006 to 2018. The study used data from the World Bank's Enterprise Survey (WBES) and World Development Indicators (WDI) to reveal various institutional factors influencing SMEs' adoption of technologies and subsequent performance via multilevel regressions. The

This is a post-peer-review, pre-copyedit version of an article published in the Entrepreneurship & Regional Development. The final authenticated version is available online at: http://dx.doi.org/10.1080/08985626.2023.2208555.

findings suggest institutional barriers become insignificant when firms use digital technologies and suggest that it may insulate SMEs from exogenous shocks.

Keywords: Digital technology, institutions, regional context, total factor productivity, multilevel analysis

1. Introduction

The proliferation of digital technologies has revolutionised the ways businesses develop, grow, and sustain. The significance of a solid digital strategy cannot be understated, as the past 20 years of evidence provides unequivocal accounts of numerous benefits of learning, market interactions, and growth potential benefits. While these benefits are readily understood and accepted, there remain differential observations about how digital has been adopted in resource-constrained SMEs around the globe.

Digital entrepreneurs and small and medium-sized enterprises (SMEs) communicate more effectively and broadly than ever (Cheng et al. 2010; Gabellone 2015; Harrison and Hair 2017; Parise et al. 2016). This has important implications for society, as SMEs and entrepreneurs are often viewed as a driving force in the structural transformation of economies (Audretsch and Keilbach 2008). They have long generated socio-economic vitality for regions by stimulating local human capital development, financial resources, unique products, and social capital. Indeed, evidence suggests that digital technologies provide a key and multifaceted resource for entrepreneurs and SMEs to achieve these activities (Giones and Brem 2017). The numerous applications and versatility of digital technology integration have allowed more firms to innovate their business model designs (Correani et al., 2020; Nason and Wiklund 2018). Still, it has been noted that traditionally SMEs' growth and performance are prone to numerous implicit barriers (Bloom and Van Reenen 2012). While SMEs are often skilled in adapting their resources to navigate varying environmental conditions (Urbano et al. 2019), how they adopt digital strategies to promote firm-level performance is poorly understood. How and under what conditions SMEs integrate, benefit, and evolve due to a digital strategy across regions remains an elusive concept in the literature and practice.

Digital technology and e-commerce positively affect the entrepreneurial process (Li et al. 2018; Shemi and Procter 2018; Hervé et al. 2020; Kimuli et al. 2021). The importance of this notion has gained greater attention due to the rise of e-commerce, recent exogenous pressures, and the emergence of new applications across numerous traditional sectors, i.e., education, finance, security, healthcare, entertainment, and e-commerce (Modgil et al. 2022, 1). It has been suggested that firms utilise digital technologies (i.e., websites) to facilitate productivity and communicate their strategic objectives, products, operational processes, and advertise, little has been said about their capacity to help firms overcome pressure from the environment (Nambisan 2017; Suhartanto and Leo 2018). In this regard, digital technology becomes a proximate determinant that spurs firms' output to higher levels. However, the potential to maximise growth via digital strategies implies the utilisation of widely distributed technologies within particular institutional settings, such as personal devices (mobile phones, tablets, computers, etc.), media platforms, and internet infrastructure within regions. Implicit within this level of stratification is that institutional context plays a role in the effectiveness of a digital strategy and firm-level capabilities (Teece et al. 1997).

Digital technologies provide a *potential* resource for SMEs and firm-level growth (Li et al. 2016), but the interconnected nature of how a digital technology strategy can be implemented and then maximised within varying social environments remains debatable. Accessing digital infrastructure can present firms with varying enabling or barrier factors that can affect utilisation that is observable across varying institutional levels and regions (North 1990; Williamson 2000). This is because institutions are complex and multi-layered social structures, with macro-level factors representing countries and regions (Williamson 2000) and that must coalesce with various micro-level contingencies to stimulate outcomes (such as entrepreneurship and firm growth) (cf. Audretsch et al. 2021). Furthermore, assessing the nature of interactions in the face of rapid technological diffusion, emergence, or even stagnation is impacted by the inter-relationships occurring between the available resources and different institutional settings. For instance, research has demonstrated on how micro-level interactions and contingencies release pressure from external (or upper) levels (Belitski et al. 2021; Li et al. 2016; Molina-Morales et al. 2019). Understanding how digital technologies connect within the interplay between internal factors (e.g., human capital skills

deficiency) and external institutional obstacles (e.g., informal competition and tax burden at the city and national level, etc.) for translating economic and organisational determinants into performance is of great importance for both academics, policy makers, and practitioners. It is vital in developing regions and countries (such as Latin America) where macro-institutions are not designed to be facilitative (Aguinis et al. 2020; De Castro et al. 2014).

This research explores the role of digital technologies in helping SMEs navigate internal (firm) and institutional environments (regional and national) for growth. We depart from North (1990) and Williamson (2000) to conduct a multilevel analysis that considers macro-level and micro-level factors. We extend the literature that has focused on exploring digital technologies as a tool for SMEs' growth (Li et al. 2016) and contribute to the debate on the institutional analysis of SME performance (North 1990; Williamson 2000). To this end, we combine two datasets at the firm (micro) level from The World Bank's Enterprise Survey (WBES) and the country (macro) level World Development Indicators (WDI). Using multiple data points derived from 2006 (wave 1), 2009 to 2010 (wave 2), and 2016 to 2018 (wave 3) and from 16 countries and 88 regions of Latin America and the Caribbean, the study reveals a negative effect of multi-layered obstacles (such as the human capital skills' deficiency, informal competition in regions, and the country-level tax burden) on total factor productivity. This effect becomes insignificant when comparing firms without and with digital technologies (e.g., adopting a website).

This study presents several contributions. First, we emphasise the importance of understanding the multi-layered influence of institutions on firm growth (Williamson 2000). Second, the study reveals how utilizing digital technologies becomes a relevant versatile resource for firms when the institutional environment is less facilitative. Third, our multilevel strategy helps unveil the importance of considering the simultaneous effects of national and regional environmental factors on firms and productivity. We contribute to the calls for more research to develop insight into the influence multi-layered regional and cross-country institutional settings have on firms proposed by Audretsch et al. (2021) and Wurth et al. (2022).

2. Theoretical framework:

2.1. Institutional Theory

Institutional theory focuses on understanding how varying social configurations and processes impact economic performance (North 1990). For instance, institutional conditions have been shown to affect the economic performance of nations (Constantine 2017), such as GDP (Aguirre 2017), employment (Nickell and Layard 1999), taxes (Acemoglu 2010), and productivity at the national, regional, and firm-level (Balcerzak and Pietrzak 2016; Rodríguez-Pose and Ganau 2022). While authors have long agreed that institutions affect the ways firms and societies behave, there remains a lively debate on how varying levels of influence can be understood, their factors, and how these manifest in varying situational contexts (i.e., regions and firm sizes). Pivotal to this debate are the role, influence, and variables that comprise formal versus informal institutional pressures, mechanisms, and voids.

On an overarching level, authors generally agree that two primary forms of institutions are formal and informal. Formal institutions are typically comprised of explicitly mandated controls, such as political institutions (Ostrom 1990), regulatory institutions (Young et al. 2018), and property rights institutions (Acemoglu and Johnson 2005). There are also informal institutions that play a fundamental role in the establishment of the norms and behaviour of a society (North 1990), such as individualistic orientation (Inglehart 1990), the social integration process (Rauhut 2020), reciprocal behaviour (Boddewyn and Peng 2021), amongst others. Williamson (2000) classifies these institutions as top-level (culture, formal rules) and bottom-level factors (governance structure and resources), which can be found at the country, city, and firm levels.

From a formal perspective, governmental bodies can shape the nature of economic exchange by infusing a market through the formation of regulatory controls, financial incentives, and other forms of facilitative support. Informal institutions comprise varying cultural and implicit normative behaviours within a region. The interplay between institutions and some inherent variables of the production process, such as productivity at different levels, is calling the attention of scholars, practitioners, and policymakers since firms are responding

to changes in the environment to achieve higher efficiency (Coviello et al. 2017). It is worth noting that the impact of institutional obstacles on firms from emerging economies remains unclear (Nizaeva and Coskun 2018), especially in Latin American and Caribbean countries (Cardoza et al. 2016).

This is particularly apparent within cities of Latin American countries, where institutions seem to impose barriers that create uncertainty due to a lack of formalisation of regulatory institutions typically observed in developed economies (Hawash and Lang 2020; Leyva and Urrutia 2020). In particular, the Latin American case provides a compelling backdrop for analysing how macroeconomic and social-political contexts influence the development and behaviour of local firms (Carneiro and Brenes 2014). Little is known about the impact of institutions (including informality) on small companies (Dekel-Dachs et al. 2021) in such regions. In addition, each of these Latin American countries are classified as a Hierarchical Market Economy (HME) (Schneider 2009). HMEs possess distinctive attributes of business structure as they operate primarily in commodities and share a dominant type of corporation composed of family-owned private domestic firms (Schneider 2009). These Latin American firms will also face low tax benefits and high bankruptcy costs (Terra 2011). These regions can be characterised as primarily informal institutional environments (Vassolo et al. 2011), which have the potential to hinder the firms' operations and use of short-term debt (Céspedes et al. 2010). Understanding the adverse effects of institutional barriers on firm performance within this setting can offer fundamental insights into how SMEs interact with potential resources within their environment (i.e., digital technologies).

Firms must carefully navigate a variety of formal and informal institutional elements at any given time. This becomes more complex in rapidly changing environments and dynamic market conditions (Teece et al. 1997). Further, the rapid diffusion of digital technologies has enabled broader social engagement for a lower cost than previously available, thus providing firms with a resource to adapt to changing trends in dynamic institutional settings (Belitski et al. 2021). Its integration facilitates interactions, communication, and social/economic exchange within markets or communities. Given its social nature, the use of digitalization strategies should be further examined as a contingent element to institutional shocks when studying varying social structures' influence on

economic performance. There remain many questions about how digital technologies coalesce with institutional settings and how that affects productivity (Şeker and Saliola 2018).

2.2. Total Factor Productivity and digital technology

Total Factor Productivity (TFP) has long helped explain shifts in firm productivity and performance, which has included integrating new technologies, intelligence, and processes to help them adapt to adverse situations (resilience) the market presents. TFP is generally understood as the portion of output not explained by the number of inputs used in production, i.e., how efficiently and intensely the inputs are utilised (Comin 2013). TFP has been studied from numerous perspectives, including various measures (Maudos et al. 1999; van Beveren 2012); effects of economic variables (especially from human capital) to modify its level (Miller and Upadhyay 2000); influences on economic growth (Turner et al. 2013), regional development (Beugelsdijk et al. 2018) and firm performance (Şeker and Saliola 2018).

As a result of this notion, much attention to the antecedents and economic consequences of productivity has subsequently been debated by scholars. For example, Solow (1957) establishes countries grow mainly due to two key factors, capital and technological change (later called the "Solow residual"). Solow (1957) states that 87.5% of U.S. economic growth from 1909 to 1949 is attributed to technological change, while the other 12.5% is attributed to capital. This is of vital importance as the "Solow residual" would become a couple of decades later the most common measure scholars used to calculate productivity shocks, i.e., an empirical measure of total factor productivity (TFP) at the firm- and country-level (Bloom and Van Reenen 2007).

Since TFP measures firm performance, it is essential to understand how SMEs may boost it while overcoming institutional barriers in their operations. Some authors contend that this can be achieved if companies pose resources that allow them to versatilely recombine and reuse resources to reduce uncertainty created by hostile environments (Nason and Wiklund 2018; Penrose 2011). This is particularly true when it comes to the utilisation of digital technology (c.f., Hawash and Lang 2020; Sobieraj and Metelski 2021). On the one hand, Hawash and Lang (2020) estimate the impact of information and communication

technology (ICT) on total factor productivity using capacity and usage-based approaches. These authors find that ICT is an engine of TFP growth as countries with relatively high ICT investment may be able to increase their TFP growth rates between 0.1 and 0.3% annually relative to those with modest investment rates. On the other hand, Sobieraj and Metelski (2021) examine the performance of several potential TFP growth determinants, relying on the Bayesian modelling analysis (BMA) methodology. The authors find an increasing contribution of ICT assets to economic growth and economies of scale, which is why economic systems exhibit increasing returns to scale (IRS).

Within SMEs' productivity, digital technologies have improved efficiency and effectiveness in various business functions. However, how TFP manifests itself in SMEs utilising digital technologies and the complex institutional environments of Latin American countries has not been extensively studied (Hawash and Lang 2020). This research seeks to fill these gaps by studying the negative effect of institutional barriers on firm productivity (TFP) in Latin American countries. In the quest to take a step forward, we also analyse how digital technologies influence this relationship.

3. Hypotheses development

Prior research has analysed the effect of institutional barriers on TFP behaviour. For instance, Manca (2010), Mojaver (2009), and Smorodinskaya et al. (2019) all find an adverse effect of institutional barriers using a range of methodologies, theoretical frameworks, and country-level contexts. However, delving deeper into the literature, it can be seen that most research in this area focuses on understanding how firms navigate institutional barriers to drive their TFP through analysing the relationship between versatile resources (e.g., digital technologies) and context-dependent growth (e.g., organisational, industrial, and country-level) (Nason and Wiklund 2018). While authors generally acknowledge that institutional settings are complex and multi-layered social structures, these studies assess this relationship from one-dimensional theoretical framing. This trend has the potential to overlook simultaneous effects occurring at different conceptual levels. Our research addresses the need to examine the effects of institutional barriers across multiple levels (e.g., country, city, and firm levels).

In the extant literature, individual- and country-layer factors that explain entrepreneurship and growth are abundant (Bjørnskov and Foss 2016; Urbano et al. 2019). This multi-layered approach aligns with the notion proposed in prior literature (cf. Williamson 2000), in which governance and resources (i.e., organisational level) influence the effect of regulations and norms (both taking place at the regional and national level). Further examples such as Thornton et al. (2011, 106-107) posit that economic agents (i.e., people and firms) socialise at the individual (family and community), organisational (workplace and industry), and macro level (region and country). Yet, Zhai et al. (2019, 5) claim that further research on micro- (i.e., cognitive institutions such as human capital behaviour and policies) and macro-level institutions (i.e., legal norms for entrepreneurship –such as legal status of private businesses–, market freedom –or competition–, and governance –encompassing taxes and power), which can be observed in regions and countries, is needed. Zhai et al. (2019) emphasise the economic agents' behavioural response when these institutional levels impose barriers to entrepreneurially acting and growing, which is common in Latin American countries (Aguinis et al. 2020).

The literature frequently refers to human capital determinants of TFP as a firm-level institutional mechanism (Maudos et al. 1999). Human capital generally contributes positively to total factor productivity (Miller and Upadhyay 2000; Männasoo et al. 2018). However, numerous other factors have been attributed to the outcomes of the TFP with variable results. For instance, immigration has been found to have a robust and positive association with total factor productivity, dependent on how educated the migrants are (Peri 2012). Indeed, the core of Hausmann's (2016) theory of economic development acknowledges institutions as factors enabling the acquisition and transmission of knowledge across countries through migration. Yet, further studies focusing on the effect of high-skill immigration on productivity have found no correlation with productivity at the firm level and are strongly negatively correlated with productivity in low-tech industries (Paserman 2013).

In contrast, further results suggested a positive relationship in high-technology industries, hinting at complementarities between technology and the skilled immigrant workforce (Kangasniemi et al. 2012). Thus, a vigorous debate remains on the input factors needed to fuel TFP within firms, industries, and regions. At the individual level, Muñoz-

Mora et al. (2022) have shown that the migration of the skilled population to lagged regions increases the possibility of spurring entrepreneurs' performance. This is achieved if the utilisation of such human resources follows national and regional labour regulations and if firms have internal rules (i.e., institutions) that encourage them to hire foreign staff to increase the stock of knowledge needed for growth. Urbano et al. (2020) present firm-level evidence for this idea. From an institutional economics angle, these authors have shown that the absence of these institutions (i.e., lack of training programs abroad and the absence of foreign staff) negatively affected firms' performance across industries.

The literature on the relationship between human capital (high and low skilled) and productivity, extant evidence emphasises that industries using more human-capital-intensive technologies experienced a more significant gain in total factor productivity, which also accelerated new technology adoption (technological frontier, which considers digital advances) (Berlingieri et al. 2020; Che and Zhang 2018). Other research considers the technological frontier in that human capital plays an essential role in accelerating the technological catch-up (increase in efficiency) but not in the technological changes (shifts in the frontier), meaning that countries benefit from new technology (technological catch-up) only when they can exploit it (Mastromarco and Simar 2021). It is vital to consider the effects of an educated workforce and the role that digital technologies can play on TFP (Madsen 2014), therefore, allowing us to establish the following hypotheses:

Hypothesis 1a: Human capital skills deficiency (as a firm-level institutional barrier) negatively affects SMEs' TFP performance.

Hypothesis 1b: Digital technology use weakens the (institutional) firm-level human capital skills' deficiency-SMEs' TFP performance nexus.

Moving onto an upper level (i.e., city level), the literature on the effect of institutions on economic performance and its factors has been extensively studied (Acemoglu et al. 2005; Rodrik et al. 2004). This is the case of the relationship between institutions and TFP, as it has become clear through seminal research that institutions can drive productivity. It has been found that the quality of the institutional system in the context of a knowledge-based economy (KBE) significantly influences total factor productivity (Balcerzak and Pietrzak

2016). Furthermore, the dynamics of TFP are dependent on initial conditions, institutional quality, and levels of openness are essential determinants of growth (Tebaldi 2016). These results even align with observations made about the shadow economy. However, once the output is corrected for the shadow economy, the relationship between institutions and output becomes weaker, and the effect of institutions on total ("corrected") factor productivity becomes insignificant (Dreher et al. 2014).

Still, the effects of institutional barriers on TFP at the city level have not received much attention from scholars. Restuccia (2004) develops a growth model where a single good can be produced with traditional and modern technology, featuring low total factor productivity and a low share of reproducible capital. In his framework, institutional barriers to capital accumulation affect technology use and, therefore, the aggregate TFP. Further studies have employed a metafrontier malmquist luenberger index and a spatial Durbin model to investigate the influence of both local and civil environmental regulation and its spatial spillover effect in 273 cities of China for ten years for a view into green TFP (Li and Wu 2017). Focusing on the key results, the authors show that the effect of local environmental regulation on green total factor productivity is significantly positive in high political attribute cities (A1 and A2 zone) but negative effects in lower political attribute cities (B2 and B3 zone), demonstrating an implicit barrier between regions.

Moreover, the literature is further reduced if we review the effect of specific institutional barriers, such as informality, on TFP. Leyva and Urrutia (2020) ask how labour regulation and informality affect macroeconomic volatility and the propagation of shocks in emerging economies, finding that the presence of an informal sector might help to mitigate the impact of stringent labour regulation on employment and consumption fluctuations. In that sense, it adds flexibility to the economy in its adjustment to shocks, but at the cost of lower productivity and an excess TFP and output volatility.

The work on how digital technologies fit into this relationship is still in its infancy. Only one article stands out, which applied the pooled regression to examine the innovation-driven effects of the digital economy index on total factor productivity in China (Pan et al. 2022). The authors showed that this index has a positive nonlinear relationship with provincial TFP. It demonstrates that the digital economy acts as an innovation driver for the

extensive and sustainable development of TFP. Albeit this research still overlooks the opportunity to integrate the role digital technologies can play in the relationship between institutional barriers and TFP at the city level, it sheds light on where the effects can be directed. Although the literature is precarious on this set of relationships, it at least elucidates the direction in which some effects are heading, allowing us to hypothesize the following:

Hypothesis 2a: Informal competition (a city-level institutional barrier) negatively affects SMEs' (TFP) performance.

Hypothesis 2b: Digital technology use weakens the (institutional) city-level informal competition-SMEs' TFP performance nexus.

As firms also respond to country-level variations, it is essential to understand how national institutions enable or disable a firm's productivity. Throughout economic history, the role of fiscal policy in the entire macroeconomic apparatus has been highlighted. In this sense, fiscal institution plays a fundamental role in establishing and enforcing fiscal policies (Hallerberg and Wolff 2008). One of the primary roles of these fiscal institutions is to establish the budget and taxation of economic agents (Aaskoven 2018).

The literature analysing the effects of taxes on the economy is extensive, such as the effects on education (Glomm and Ravikumar 1998), the environment (Shahzad 2020; Wang and Wang 2009), consumption (Parker 1999), health (Jacobson and Brownell 2000; Mytton et al. 2007), entrepreneurship and SMEs (Baliamoune-Lutz and Garello 2014; Bergmann 2011), and economic growth and development (Alinaghi and Reed 2021; Hanson 2021).

The impact of tax effects on TFP has been largely analysed. A recent study on the effect of tax policy on TFP found that firms' tax credits produced a positive and significant effect on productivity (Huang 2014). Higher corporate taxation discourages industrial firms from undertaking research and development, adversely impacting firms' TFP (Khan et al. 2020). In recent research, corporate tax liability was the critical driver of economic performance (TFP) (Bournakis and Mallick 2021). For instance, it has been shown that high levels of corporate taxation adversely impact TFP. This study also suggested that R&D and export-intensive firms tend to have higher TFP growth (Bournakis and Mallick 2021, 5).

Albeit the literature studying the relationship between taxes and total factor productivity is extensive, there is no evidence of the intervention of digital technologies in

this relationship. However, the intervention of digital technology, such as using websites at the firm and city level, indicates that it might have the same implications at the country level. Therefore, this literature review allows us to establish that:

Hypothesis 3a: Tax burden (as a country-level institutional barrier) negatively affects SMEs' TFP performance.

Hypothesis 3b: Digital technology use weakens the (institutional) country-level tax burden SMEs TFP performance nexus.

4. Methodology

4.1 Data

To assess our hypotheses, we used two datasets from the World Bank. First, we built the pooled cross-sectional datasets of firms from the Enterprise Survey (WBES) collected between 2006 (wave 1), 2009, 2010 (wave 2), 2016, and 2018 (wave 3). The WBES has the virtue of capturing homogenous information across firms, cities, and countries. The World Bank (2022) posits that the data are collected through interviews with firms' managers in the manufacturing, construction, commerce, and service sectors, as well as transport, storage, and communications. Hence, the WBES aims to collect a representative sample of the non-agricultural and non-extractive formal private economy. It represents the population of firms listed in the International Standard Industrial Classification (ISIC, revision 3.1), including groups D, F, G, H, I, and K.

In general, the WBES helps understand the managerial perception of those barriers that reduce firms' performance and all those elements, such as employment and productivity, that explain SMEs' growth. According to The World Bank (2022), the WBES is representative of each country. The sampling methodology enables scholars and policymakers gain information at the firm level, which is weighted for each sector, size, and region, with a minimum of 7.5% precision for 90% confidence intervals. Although it covers main cities' information, regional analyses can be derived from this dataset (Kalyuzhnova and Belitski 2019). Second, we utilised the World Development Indicators (WDI) to merge country-level information with the first dataset. Thus, we built our unique pooled cross-

sectional dataset composed of 11,044 observations, i.e., random firms actively producing in 88 regions from 16 countries in Latin America and the Caribbean. It is worth mentioning that both databases have been used to conduct meaningful research on entrepreneurship and firm growth (Williams et al. 2017), providing insights into the relationship between institutional barriers, resources, and performance (Audretsch et al. 2022; Carney et al. 2019; Islam et al. 2018). Table A1 in the online supplementary material shows the number of firms by city and country.

To test our three hypotheses, we used the TFP measure of the World Bank (Francis et al. 2020) as the dependent variable. This measure, ranging from -3.948 (low-) to 10.499 (high-productivity), considers the gross output and value-added production functions that similarly rank sectors in output elasticities, capital intensity, and returns to scale. For our purposes, we use the value-added specification since it estimates the basic form of the Cobb-Douglas function with capital and labour inputs (excluding expenditure on input materials). Francis et al. (2020) perform OLS estimates and then proceed to develop a logarithmic transformation that allows them to run estimates for 21 industries of each country (showing significance in 17 out of the 21 industries used in the estimation); in the end, grouping all industries and obtaining the final productivity value. It is worth noting that there is only one missing value for the productivity variable and 101 for full-time female employees.

We used three explanatory variables, one for each level. First, at the firm level, we transformed a categorical variable that reveals the level of obstacle that human capital skills' deficiency means for the firms' current operations (where 0 is equal to no obstacle, 1 is equal to a minor obstacle, 2 represents a moderate obstacle, 3 is equal to a significant obstacle, and 4 is equal to a very severe obstacle), and we code it as a binary variable that takes value 0 when human capital skills' deficiency represents a minor obstacle or no obstacle for the firms' current operations (i.e., categories 0 and 1 in the original variable); and value of 1 if it represents a moderate, major, and very severe obstacle for the firms' current operations (i.e., categories 2, 3, and 4 in the original variable). Second, at the city level, we aggregate a firm-level variable that indicates the average of the obstacle that represents the competitors in the informal sector to the firms' current operations (where 0 is equal to no obstacle, 1 is equal to a minor obstacle, 2 represents a moderate obstacle, 3 is equal to a significant obstacle, and 4

is equal to a very severe obstacle). We used the firms' percentage mean value at the city level. Both variables were taken from the WBES. Finally, we used the total taxes and contribution rate variable at the country level (as a percentage of commercial profits) found at WDI.

Another variable of importance in this research is digital technology (i.e., the possession and utilization of a website). We used this variable to split the sample and assess productivity and firm obstacles in subgroups. This variable takes the value of 1 when the firm affirms that it uses a website and 0 otherwise. Following Sahut et al. (2021), some definitions of digital entrepreneurship have emerged, contributing to academia in two main ways: i) research on how digitalization is transforming entrepreneurship and the traditional venture creation process (i.e., digital technologies as enablers); and ii) research on generated entrepreneurial opportunities through digital technological innovation (i.e., digital technologies as both enablers and outputs). Our approach fits the first definition since we want to observe how the effect of institutional barriers on TFP varies if firms have and use websites. Prior research has shown these are vital for the commercialization process of the firms as well as a critical determinant for their growth (Barroso et al. 2019; Ipsmiller, Dikova, and Brouthers 2022).

In addition, firm, city, and country variables are used to control unobservable characteristics. At the firm level, a variable indicating the number of female employees (non-production workers) and another variable to discriminate the size of the companies (dummy variables if the company is small [>=5 and <=19], if the company is medium [>=20 and <=99], and if the company is large [>=100]) are used, employing large firms as a reference category. At the city level, we used the mean value of variables such as electricity and transport obstacle level for firms, sales, indirect export sales, and direct export sales (taken from WBES). Finally, WDI variables such as the labour force and participation rate percentage, mobile cellular subscription (per 100 inhabitants), gross capital formation (% of GDP), and GDP per capita at constant prices (i.e., 2017 international dollars at purchasing power parity [PPP]) are used at the country level. The online supplementary material can provide a detailed description of the utilised variables (Table A2).

4.2 Empirical strategy

A three-level model (with random intercepts [mixed effects]) is used to observe the effect that some obstacles (at the firm, regional, and country-level) have on the TFP of firm i, within region j nested in-country k:

$$\boldsymbol{TFP}_{ijk} = \alpha + \boldsymbol{O}_{ijk}\boldsymbol{\beta} + \boldsymbol{X}_{ijk}\boldsymbol{\theta} + \boldsymbol{Z}^3_{ijk}\boldsymbol{u}^3_k + \boldsymbol{Z}^2_{ijk}\boldsymbol{u}^2_{jk} + \boldsymbol{\epsilon}_{ijk} \quad (1)$$

For $i = 1, \ldots, n_{jk}$ (where n is equal to the observations; 11,145 in our case,) firm-level observations nested within $j = 1, \ldots, M_k$ (where M_k is equal to the number of independent groups for the regions) regional-level groups, which are nested within $k = 1, \ldots, M$ country-level groups (where M is equal to the numbers of independent groups for the countries). Group j, k consists of n_{jk} observations, so $\boldsymbol{TFP}_{ijk}$, $\boldsymbol{O}_{ijk}\boldsymbol{\beta}$, $\boldsymbol{X}_{ijk}\boldsymbol{\theta}$, and $\boldsymbol{\epsilon}_{ijk}$ each has a row dimension n_{jk}. Where $\boldsymbol{O}_{ijk}$ is the design matrix for different obstacles variables (i.e., explanatory variables) at the firm, regional, and country levels, so $\boldsymbol{O}_{ijk}$: {$\boldsymbol{IW}_{ijk}$ [human capital skills' deficiency]; $\boldsymbol{IC}_{jk}$ [informal competition]; $\boldsymbol{TB}_k$ [tax burden]}. $\boldsymbol{X}_{ijk}\boldsymbol{\theta}$ is the design matrix for control variables. $\boldsymbol{TFP}_{ijk}$ is the vector of responses for total factor productivity. $\boldsymbol{Z}^3_{ijk}$ is the $n_{jk} \times 1$ design matrix for the third-level random effects $\boldsymbol{u}^3_k$, while $\boldsymbol{Z}^2_{ijk}$ is the $n_{jk} \times 1$ design matrix for the second-level random effects $\boldsymbol{u}^2_{jk}$. In addition, it is assumed normal distribution for random effects is as follows:

$$\boldsymbol{u}^3_k \sim N(0, \Sigma_3)\ ;\ \boldsymbol{u}^2_{jk} \sim N(0, \Sigma_2)\ ;\ \boldsymbol{\epsilon}_{ijk} \sim N(0, \sigma^2_{\boldsymbol{\epsilon}}\mathbf{I}) \quad (2)$$

And that $\boldsymbol{u}^3_k$, $\boldsymbol{u}^2_{jk}$ and $\boldsymbol{\epsilon}_{ijk}$ are independent. The variable list for the third-level random-effects equation is represented by $\boldsymbol{Z}^3_{ijk}$ and the second-level random-effects equation is represented by $\boldsymbol{Z}^2_{ijk}$, with both set to the $n_{jk} \times 1$ column of ones. Finally, it is essential to mention that in our case $\Sigma_3 = \sigma^2_3$ and $\Sigma_2 = \sigma^2_2$ are both scalars (STATA 2021).

To carry out the estimations, we first performed an OLS estimation that would allow us to identify the effects of our explanatory variables (without taking into account the country and regional levels), which would result in an equation as follows:

$$TFP_{ijk} = \alpha + \beta_{\{1,2,3\}} O_{ijk} + \theta_1 X_{ijk} + \epsilon_{ijk} \quad (3)$$

Where TFP_{ijk} is our dependent variable, O_{ijk}: $\{\boldsymbol{IW}_{ijk}$ [human capital skills' deficiency]; $\boldsymbol{IC}_{jk}$ [informal competition]; $\boldsymbol{TB}_k$[tax burden]{firm, regional, and country levels are the respective explanatory variables. Also, we condition on X_{ijk}, which contains the unobservable effects of some firm, regional, and country variables (controls), such as the number of female employees (non-production workers), the size of the companies (small and medium), electricity and transport level of an obstacle for firms, sales, indirect export sales, direct export sales, labour force, and participation rate, mobile cellular subscription, and gross capital formation. Then, when we apply the mixed estimation for the three-level model, the digital technology bias (i.e., websites) is considered. Therefore, we perform the estimates when websites=0 and when websites=1. This empirical strategy enables us to estimate the effects of our explanatory variables on TFP considering the digital technology bias.

5. Results

5.1. Main findings

Table 1 displays the descriptive statistics for all variables used in our models. Some interesting statistics deserve attention. First, 63.3% of firms consider the human capital skills' deficiency a moderate, major, and very obstacle to their current operations; second, at the city level, about 2.06 is the average obstacle that represents the competitors in the informal sector to the firms' current operations; third, at the country level, the tax burden is about 59%, a percentage that is relatively high as compared to developed countries (Belitski et al. 2016); fourth, 76% of the sample are small and medium-sized firms; finally, 55.8% of firms use their website, indicating heterogeneity amongst firms within the sample. In addition, a correlation matrix can be found in the online supplementary material (Table A3). The negative correlation between regional, and country-level obstacles and total factor productivity can be appreciated.

Table 1. Descriptive statistics

Variables	Mean	SD	Min	Max	P25	P50	P75	p99	N

Total factor productivity	2.991	1.731	-3.948	10.499	1.850	2.831	3.991	8.072	11044
Human capital skills' deficiency	0.633	0.481	0	1	0	1	1	1	11044
Informality	2.066	0.344	0.731	3	1.853	2.166	2.315	2.683	11044
Total tax and contribution rate	59.018	36.227	10.7	203.8	37.263	58.3	72.5	203.8	9614
Website	0.556	0.497	0	1	0	1	1	1	11044
High Speed Internet	0.878	0.326	0	1	1	1	1	1	4228
Full-time female employee	11.801	41.219	0	1800	1	3	9	160	10626
Small firm	0.394	0.489	0	1	0	0	1	1	11044
Medium firm	0.379	0.485	0	1	0	0	1	1	11044
Large firm	0.226	0.418	0	1	0	0	0	1	11044
Electricity	0.725	0.107	0.264	1	0.617	0.743	0.814	0.896	11044
Transport	1.426	0.297	0	2.513	1.265	1.375	1.522	2.513	11044
National sales	88.339	6.577	50	100	84.854	88.122	93.467	99.043	11044
Indirect export sales	2.847	1.826	0	33.333	1.249	2.441	4.558	7	11044
Direct export sales	8.755	5.519	0	38.864	4.281	7.139	11.156	24.824	11044
Labour force	61.546	9.027	39.450	75.990	56.110	60.525	69.433	75.220	10134
Mobile cellular subscriptions	84.956	37.854	2.671	190.814	62.418	91.113	112.445	170.987	10851
Gross capital formation	24.069	8.052	10.073	48.544	18.972	21.946	28.536	48.544	9593
GDP per capita	21941.08	15444.74	884.495	58810.4	10970.71	15824.03	42147.67	48842.62	10802

Note: N is equal to the observation. P25, P50, P75, and P99 are the respective percentiles.

Table 2 shows our three-level modelling through OLS and Mixed-Effects regression with a digital technology bias. Models 1-3 show results for the firm-level obstacle (human capital skills deficiency). Model 1 presents the OLS estimation, while models 2 and 3 show the estimation obtained through the mixed effects. Models 2 and 3 consider the digital technology bias. Specifically, model 2 shows the effect of the firm-level obstacle for firms that do not use a website; and model 3 assesses those firms' effect. The same structure is repeated for models 4-6 (regional-level obstacle) and 7-9 (country-level obstacle). It can be seen that the estimates of the mixed-effects models with random intercept present a better fit

to the data than the OLS estimates since the AIC and BIC information criteria are much lower for these models.

Regarding the hypothesis testing, model 1 reveals the negative effect of the firm-level human capital skills deficiency as a perceived obstacle to companies' TFP. When the human capital skills deficiency is considered a moderate, major, and very severe obstacle, the TFP decreases by 0.215%, which supports hypothesis 1a. Concerning the digital technology bias, if we observe model 2, the effect continues to be negative in the absence of digital technologies since TFP decreases by 0.326%. However, for firms that use its websites (model 3), the effect is negative (0.107%) but decreases along with its significance (from $p<0.05$ to non-significant). These results support hypothesis 1b. Theoretically, the results suggest that adopting and utilizing a website as a tool disallows the significance of institutional barriers at the firm level, such as human capital skills deficiency. As Madsen (2014) suggests, digital absorption as a resource to overcome internal and external changes takes time. Therefore, it could be intuited that in a dynamic and balanced model, the result would further disable the negative effect of this institutional barrier.

As per the second set of hypotheses, model 4 reveals the negative effect of the perceived obstacle posed by informal competition on a firm's TFP. Thus, when city institutional obstacle, such as perceived obstacle posed by informal competition (informality), increases by 1%, TFP decreases by 0.651%. This finding supports hypothesis 2a. Observing the mixed effects specification, the behaviour is similar to the firm level since the effect continues to be negative (-1.104% [model 5]). Still, its significance is relatively tiny ($p<0.05$) when we focus on firms that do not use their website.

Interestingly, when firms do use digital technology, such as a website, although they show a negative effect on TFP (-0.172 [model 6]), the statistical significance is lost (it goes from $p<0.05$ to non-significant). The effect is reduced by 0.93 percentual points. Thus, we can ensure that the results of models 4-6 support the proposed hypothesis 2b. In a theoretical sense, digital technologies such as websites can disable the strong negative effects of institutional barriers at the city level, which is in line with Pan et al. (2022).

Regarding the third set of hypotheses, model 7 reveals the negative effect of the country-level institutional barrier, such as tax burden, on the firms' TFP (-0.008, with a

significance of p<0.001), supporting what hypothesis 3a states. Considering the digital technology bias, the behaviour exposed at the firm and city level is repeated at the country level as those firms that do not use their website, a 1% increase in tax burden generates a decrease in the TFP of 0.011% (p<0.01). However, although negative (-0.004) for those companies that use their website, this effect is not significant, supporting hypothesis 3b. This is an important finding as it brings novel evidence regarding the interplay between taxes, digital technology, and productivity. Overall, these results help us understand two fundamental aspects of the research. First, considering different levels when evaluating the effects of institutional barriers could lead to omitting relevant variables, causing biases and inconsistencies. Second is the importance of technological bias, such as using websites to disable the significance of institutional barriers at different levels.

Table 2. Effects on total factor productivity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	OLS	**Mixed Effects**		**OLS**	**Mixed Effects**		**OLS**	**Mixed Effects**	
		Website=0	**Website=1**		**Website=0**	**Website=1**		**Website=0**	**Website=1**
Obstacle: at firm level									
Human capital skills' deficiency	-0.215*	-0.326*	-0.107						
	(0.109)	(0.164)	(0.113)						
Obstacle: at city level									
Informality				-0.651**	-1.104*	-0.172			
				(0.231)	(0.532)	(0.252)			
Obstacle: at country level									
Total tax and contribution rate							-0.008***	-0.011***	-0.004
							(0.002)	(0.003)	(0.002)
Control variables at firm level									
Full-time female employee	0.003*	-0.006	0.004*	0.003*	-0.007	0.004*	0.003*	-0.003	0.003*
	(0.001)	(0.005)	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)	(0.005)	(0.001)
Small firm (<20)	-0.060	-0.121	0.138	-0.024	-0.056	0.146	-0.057	-0.063	0.159
	(0.118)	(0.171)	(0.085)	(0.115)	(0.159)	(0.085)	(0.120)	(0.133)	(0.082)

Medium firm (20-99)	0.163	0.181	0.168*	0.176	0.202	0.172*	0.099	0.125	0.148
	(0.108)	(0.143)	(0.082)	(0.108)	(0.142)	(0.087)	(0.110)	(0.149)	(0.089)
Large firm (=>100)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Control variables at city level									
Electricity	-0.023	0.476	-0.280	-0.558	-0.478	-0.379	-0.237	0.243	-0.491
	(0.634)	(1.296)	(0.702)	(0.673)	(1.165)	(0.710)	(0.699)	(1.309)	(0.657)
Transport	0.058	0.206	-0.233	0.540	1.041	-0.134	-0.114	-0.162	-0.257
	(0.281)	(0.566)	(0.258)	(0.329)	(0.685)	(0.334)	(0.273)	(0.447)	(0.233)
National sales	-0.387*	-0.335	-0.520*	-0.736***	-0.902**	-0.609*	-0.154	-0.009	-0.401*
	(0.176)	(0.242)	(0.207)	(0.211)	(0.349)	(0.292)	(0.182)	(0.196)	(0.169)
Indirect export sales	-0.410*	-0.305	-0.589**	-0.741***	-0.848*	-0.672*	-0.205	-0.007	-0.480*
	(0.187)	(0.306)	(0.227)	(0.213)	(0.371)	(0.304)	(0.193)	(0.269)	(0.198)
Direct export sales	-0.405*	-0.371	-0.522*	-0.760***	-0.949**	-0.611*	-0.157	-0.024	-0.397*
	(0.180)	(0.241)	(0.206)	(0.215)	(0.348)	(0.292)	(0.186)	(0.190)	(0.167)
Control variables at country level									
Labour force	-0.017*	-0.018	-0.011	-0.015	-0.016	-0.009	-0.015	-0.017	-0.008
	(0.008)	(0.017)	(0.008)	(0.008)	(0.015)	(0.008)	(0.010)	(0.018)	(0.008)
Mobile cellular subscriptions	0.005	0.001	0.009***	0.005	0.000	0.009***	0.003	-0.004	0.008**
	(0.003)	(0.005)	(0.002)	(0.003)	(0.005)	(0.002)	(0.003)	(0.005)	(0.003)
Gross capital formation	-0.015	-0.005	-0.021	-0.008	0.004	-0.018	-0.024*	-0.020	-0.024
	(0.009)	(0.020)	(0.015)	(0.009)	(0.018)	(0.015)	(0.012)	(0.021)	(0.014)
GDP per capita	-0.000	0.000	-0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time fixed effects									
Dummy 2009_2010	0.207	0.324*	0.053	0.123	0.171	0.027	0.293*	0.441**	0.087
	(0.142)	(0.134)	(0.247)	(0.142)	(0.181)	(0.250)	(0.146)	(0.159)	(0.266)
Dummy 2016_2018	-0.046	0.152	-0.364	-0.060	0.189	-0.381	-0.039	0.203	-0.393
	(0.200)	(0.272)	(0.268)	(0.198)	(0.221)	(0.272)	(0.212)	(0.223)	(0.242)
Constant	42.840*	37.060	56.303**	78.348***	95.127**	65.217*	20.683	6.246	44.779**
	(17.704)	(24.276)	(20.782)	(21.269)	(35.203)	(29.424)	(18.244)	(19.280)	(17.010)

Observations	**9175**	**3803**	**5372**	**9175**	**3803**	**5372**	**8302**	**3420**	**4882**
R-squared	**0.032**			**0.034**			**0.036**		
AIC	**36151.347**	**44.272**	**43.077**	**36131.227**	**44.250**	**43.079**	**32704.364**	**41.605**	**44.677**
BIC	**36265.335**	**150.413**	**148.501**	**36245.215**	**150.390**	**148.502**	**32816.752**	**139.803**	**155.063**
log-likelihood (LR) & F test	**3.05*****	**-5.13*****	**-5.53*****	**3.53*****	**-5.12*****	**-5.53*****	**4.91*****	**-4.80*****	**-5.33*****

Note: Standard errors in parentheses: * p<0.05; ** p<0.01; *** p<0.001. **Dependent variable:** total factor productivity. **Control variables at the firm level:** the number of female employees (Non-Production Workers) and the firm's size (dummy variables if the firm is small [>=5 and <=19] if the company is medium [>=20 and <=99], and if the firm is large [>=100], taking large firms as the reference category). **At the regional level:** electricity and transport obstacles for firms, sales, indirect export sales, and direct export sales. **At the country level:** labour force and participation rate, mobile cellular subscription, and gross capital formation. **Time (waves) fixed effects**, using the 2006 wave as the reference category. Some variables are dropped by the run specification, that is why standard errors are represented by (.). AIC and BIC are the respective information criteria.

5.2. Robustness checks

According to Lu and White (2014), the robustness check examines how specific "core" regression coefficient estimates behave when the regression specification is modified by adding or removing regressors or even the estimation method. In this case, we performed a robustness check addressing the digital technology bias and the cluster-level omitted-variable bias.

Table A4 and A5 (in the online supplementary material) shows the estimates developed for the robustness check. First, in table A4 we modified the digital technology bias. We changed the split sample from the firms that use their website to those with high-speed internet. Digital technology bias does not play a fundamental role in the relationship between institutional obstacles at the firm and city level and productivity (models 1-4). However, it plays an essential role at the country level, as these obstacles' negative effects decrease and lose significance (see models 5 and 6). Second, in Table A5 we introduced the cluster-level omitted-variable bias (Rabe-Hesketh and Skrondal 2008). In models 1-3, the expected effects with the inclusion of the omitted variable bias are related to those presented in Table 2, indicating that our model is well specified. However, it should be noted that this type of bias can only be performed for the firm-level obstacle since we cannot consolidate the average of the obstacles at the city and country levels downwards. Thus, these robustness check analyses allow us to establish that the empirical strategy and the structure of the baseline models are consistent.

6. Discussion and conclusion

This research attempted to explore digital technologies' role in SMEs' performance and varying institutional environments. Using an institutional theoretical lens (North 1990) and data covering the firm, regional, and country levels, we generate two critical contributions to the literature on entrepreneurial/SME performance and digital technologies. First, the study reveals a negative effect that some internal (firm) and institutional barriers (regional and country) have on firms' TFP. Second, it highlights the role of digital technologies such as websites as mitigators of institutional disablers' negative effects and significance.

Observing extant research such as Restuccia (2004), it can be concluded that many of the barriers faced by entrepreneurs (or companies) come from institutions (mainly formal ones). However, almost no literature highlights the relevance of the different levels, neighbourhoods, cities, regions, or countries on the firm's performance. It is, therefore, crucial to consider the context in which companies operate to identify the potential threats and strengths they face. Considering these research gaps, our study brings important theoretical and policy contributions.

6.1. Theoretical implications

Entrepreneurship literature is vast. Yet, this research converges towards three theoretical and policy implications of vital importance to the literature on digital technologies, institutions, entrepreneurship, and SMEs. The first theoretical implication highlights the importance of understanding how multi-layered institutions influence firms' productive performance (Oliveira et al. 2022; Thornton et al. 2011). Williamson (2000) explains different institutional layers, in which changes in the upper-level factors (e.g., culture and laws) take more time to influence performance than those institutions at the lower level. Interestingly, most empirical analysis has represented this theoretical approach through the top-down point of view, which means that top institutions influence bottom institutions (cf. Audretsch et al. 2021). Wurth et al. (2022) have provided a literature analysis of the multidirectional interplay between firm, regional, and country factors. Our research illustrates that SMEs respond to (top-level) institutional variations via bottom-level factors (or resources). This inside-out view highlights the relevance of digital technologies in protecting firms against institutional turbulence.

The second theoretical implication refers to the important role of digital technology (such as websites) in mitigating the adverse effects and the significance of institutional barriers in firms' productivity. The moderating effect that digital strategy has on SMEs' productivity suggests a level of influence within economies and social structures. Still, there remain gaps in the literature regarding how to apply this within traditional concepts (such as institutional theory and TFP.) Theoretical efforts (i.e., Teece et al. 1997; Bloom and Van Reenen 2012) have emphasised the relevance of firm capabilities to improve strategic decision-making and achieve higher productivity levels. Whilst Teece et al. (1997) refer to the firm's adjustment when the environment changes to gain competitiveness, the institutional analysis is not well considered within this line of theorisation. Bloom and Van Reenen (2007) offer us the managerial perspectives to understand firm growth, yet neither technology as a critical resource nor institutions are considered jointly within this line of work. In line with Coviello et al. (2017), we present evidence that conveys both institutions at different levels and digital technology as factors coexisting in the firm growth process. In this regard, the digital technology bias presented in the results ratifies what is expressed in the separated literature since the advances and use of digital technology improve the performance of companies (Chen and Yang 2017; Modgil et al. 2022).

Understanding firm performance has implied challenges when it comes to methodological approaches. It has been challenging to embed companies in regions that are part of countries (Leendertse et al. 2022). Audretsch et al. (2021) overcome this limitation to understand institutions, ecosystems, and productive entrepreneurship in cities and countries. We add further insights into the discussion by analysing different institutional barriers across. Hence, our third contribution to the literature is to promote innovative methodologies that encourage multilevel analysis since companies must be related to their environment (city, region, or country). Therefore, variables at different levels must be considered when interpreting and displaying results at the firm level.

6.2. Policy implications

Grasping the interplay of institutions at different levels and digital technology is helpful for policy discussion. For example, at the individual or firm level, the relevance of

an adequately educated and trained workforce is highlighted since firms consider that a poorly educated or trained workforce represents a significant obstacle to their operations. Our research proves its significant adverse effect on productivity, so educational institutions must close the gap between academia and industry so that students arrive more qualified at their jobs (Chaplin 2017; Hynes and Richardson 2007).

At the regional level, this research shows that competition amongst formal and informal firms is critical and negatively affects the firm's productivity. Therefore, regional institutions should guarantee and regulate market dynamics to help reduce the costs associated with formality (De Castro et al. 2014).

Finally, this research clarifies that taxes in the Latin American region are high and regressive at the country level since their negative and significant effect on firms' performance is high (Kantis et al. 2016). Fiscal institutions should try to reduce these tax burdens so that firms are more productive, achieve higher levels of growth, and thus generate a social benefit through employment. This is how policymakers are recommended to carry out accompanying campaigns for entrepreneurs and companies seeking growth based on digital technologies since this is the new way companies communicate and sell. This can be achieved through policies that expand internet use in the cities and rural areas and lowering taxes that allow greater access to mobile phones. This allows for positive results in education (Li et al. 2016), which are fundamental for absorbing rapid technological changes.

6.3. Limitations and future research lines

The findings of this study present several opportunities for future lines of research. First, this study analyses a data set from various countries and regions to find evidence of variation. This line of inquiry could be expanded more broadly to cover a more extensive set of developed and developing economies. Additionally, future research could more explicitly emphasise that variations in digital technology strategies affect firms' productivity by exploring more institutional variables from the literature. Albeit the World Bank's Enterprise Survey presents data for developed and developing countries, this survey is gathered in waves that do not allow for various methodologies across different countries or time series. Second, given the scant literature on the role of specific digital technologies in entrepreneurship and business performance, it is complex to categorise across technologies. Therefore, we

encourage future research to focus on analysing the effects of different types of digital technologies on the performance of firms. Third, future research considering the institutional perspective should go beyond the traditional analysis of countries, firms, and individuals (see Urbano et al. (2019) for further discussions). Instead, additional efforts should be oriented towards quantifying regional institutions as these variations are also meaningful for theory, policy, and practice (cf. Audretsch et al. 2021; Leendertse et al. 2022).

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