

Digital Skills and Formalization Intention Among Informal Entrepreneurs: Entrepreneurial Human Capital and Social Capital as Mediating Mechanisms

Marcelo Delgado-Guzmán¹ , Hugo Baier-Fuentes^{1*} , Natalia Martín-Cruz² 

Abstract

Objective: This study examines how digital skills, entrepreneurial human capital, and social capital shape informal entrepreneurs' intentions to formalize their businesses, conceptualizing formalization as a strategic and intention-driven decision.

Methods: A quantitative, cross-sectional design was used to collect data from a survey of 383 informal entrepreneurs in Chile. The proposed model was analyzed using partial least squares structural equation modeling (PLS-SEM) to assess the relationships among digital skills, entrepreneurial human capital, social capital, and formalization intention.

Results: Digital skills show no direct association with formalization intention but are positively associated with entrepreneurial human capital and social capital. Entrepreneurial human capital, understood as educational background and business experience, is negatively associated with formalization intention, whereas social capital shows a small positive association. Entrepreneurial human capital significantly mediates the relationship between digital skills and formalization intention, with a negative indirect effect. The indirect effect through social capital is positive but only marginally significant.

Conclusions: The findings suggest that digital capabilities are not uniform drivers of formalization intention. Instead, digital skills appear to operate through heterogeneous pathways: they may be associated with entrepreneurial human capital that reduces the perceived need to formalize, while also supporting social capital that modestly increases exposure to institutional information and formal opportunities. Theoretically, the study contributes to informal entrepreneurship and technology management by showing that digitalization may simultaneously facilitate engagement with formal systems and reinforce adaptive informal arrangements. From a practical perspective, the findings suggest that formalization policies should not rely only on digital access, online registration, or technical training. More effective interventions should combine digital public services, capability development, bridging social capital, accessible platform design, and tangible benefits of registration so that formality becomes more valuable than digitally enabled informality.

Keywords: Informal entrepreneurship; Informal Economy; Formalization intention; Digital Skills; Human Capital; Social capital.

Submitted: March 18, 2026 / Approved: July 21, 2026

1. Introduction

Informal entrepreneurship (IE hereinafter) is a structural component of contemporary economies, particularly in developing contexts where unregistered businesses account for a substantial share of economic activity and employment (Loayza, 2016; Pels et al., 2022). IE broadly refers to entrepreneurial activities that operate outside formal registration, taxation, and state regulation, while often retaining social legitimacy within local communities (Williams & Baric, 2014). Estimates suggest that IE represents around 60% of entrepreneurial activity in developed economies and more than 90% in developing ones (Salvi et al., 2023), while the broader informal sector may account for 40–60% of GDP in emerging economies and 10–15% in developed countries (Schneider et al., 2023; Sutter et al., 2017; Schneider & Williams, 2013; Schneider & Enste, 2000).

IE often emerges as a response to unemployment, underemployment, and limited access to stable jobs, providing income and survival opportunities for vulnerable populations (Palacios Duarte et al., 2022;

Pels et al., 2022; Schneider & Williams, 2013). However, informal ventures should not be viewed merely as peripheral actors. They are frequently embedded in local value chains and urban markets, sustaining productive, commercial, and service activities within broader economic ecosystems (Grant & Oteng-Ababio, 2021; Queralt, 2019; Popescu et al., 2018; Oteng-Ababio et al., 2016). Recent studies also identify informal firms operating in technologically sophisticated sectors, although their productivity generally remains below that of formal enterprises (Darbi et al., 2018; Siqueira et al., 2016).

Despite its scale and relevance, IE remains characterized by ambivalence. On the one hand, it contributes to employment generation, poverty alleviation, and economic resilience (Salvi et al., 2023; Sutter et al., 2017; La Porta & Shleifer, 2014). On the other hand, it is associated with tax revenue losses, unfair competition, and limited social protection for workers (Schneider & Enste, 2000). These tensions have made formalization a central policy objective for governments and international organizations seeking to promote more inclusive and sustainable forms of economic development.

¹Facultad de Ciencias Económicas y Administrativas, Universidad Católica de la Santísima Concepción, Concepción, Chile.

²Department of Business and Marketing, Business School, University of Valladolid, Valladolid, Spain.

*Corresponding author: hbaier@ucsc.cl

Formalization is commonly understood as the process through which informal businesses enter the regulated economy by complying with legal, fiscal, labor, and administrative requirements. Legal recognition can provide access to markets, financial services, and institutional support that may enhance entrepreneurial growth and stability (La Porta & Shleifer, 2014; Eckhardt & Shane, 2003). However, the mechanisms through which informal entrepreneurs move toward formalization remain complex and only partially understood. Existing research has largely framed formalization as a response to regulatory conditions, emphasizing registration costs, bureaucratic barriers, corruption, and mistrust in public institutions (Igudia et al., 2022; Shahid et al., 2022; De Castro et al., 2014; Webb et al., 2013).

Several perspectives have been used to explain the persistence and heterogeneity of informality. Ackrill & Igudia (2023) distinguish four main approaches: the dualist perspective, which views informality as a residual sector linked to underdevelopment; the legalist perspective, which emphasizes the interdependence between formal and informal economic activity (e.g. Williams & Kedir, 2017); the structuralist perspective, which explains informality through institutional constraints and cost-benefit considerations (Webb et al., 2020; Chen, 2012; Webb et al., 2009); and the voluntarist perspective, which interprets informality as a strategic choice (Dumenu et al., 2023; La Porta & Shleifer, 2008; De Soto, 1989). Complementary approaches have further emphasized the role of meso-level institutions (De Castro et al., 2014), institutional incongruence in formalization processes (e.g., Bravo-Ortega et al., 2024), informal governance mechanisms (Peng, 2023; Godfrey, 2011), and the interaction between structural conditions and individual agency (Langevang et al., 2015; Sepulveda et al., 2011; Kloosterman et al., 1999).

Although these frameworks have advanced the understanding of informality, they tend to prioritize macro- and meso-level explanations centered on institutional design, regulatory conditions, enforcement, and governance. As a result, micro-level factors shaping entrepreneurial perceptions, cognitive evaluations, resource mobilization, and strategic intentions remain comparatively underexplored (Adbi & Shukla, 2023; Nason et al., 2024; Shahid et al., 2022; Webb et al., 2013). This is particularly relevant because informal entrepreneurs may remain outside formal regulation not only because of external constraints, but also because informality can represent a rational and sometimes profitable equilibrium, depending on perceived benefits, risks, capabilities, social embeddedness, and access to resources (Misanaw et al., 2023; Sutter et al., 2017).

Growing attention has therefore been paid to the role of individual and relational endowments in shaping entrepreneurial behavior, particularly as digitalization increasingly reshapes entrepreneurial activity, market access, and interaction with formal institutions. Differences in education, business experience, digital competencies, and social networks may influence how informal entrepreneurs interpret institutional environments, recognize opportunities, mobilize resources, and evaluate the desirability and feasibility of formalization (Dedehouanou & Araar, 2020; Estrin et al., 2024). These endowments

can be understood as different forms of capital. Education and business experience represent key dimensions of entrepreneurial human capital, while digital skills reflect entrepreneurs' ability to engage with digital tools, infrastructures, and market interfaces in increasingly digitalized economies. Social capital, in turn, refers to resources embedded in networks, relationships, and trust that may provide access to information, legitimacy, and support in contexts of institutional fragility (Coleman, 1988; Dedehouanou & Araar, 2020; Godfrey, 2011; Portes et al., 1989).

These forms of human, digital, and social capital may shape not only entrepreneurial performance but also entrepreneurs' evaluation of formalization as a strategic option. They influence knowledge, perceived behavioral control, exposure to formal opportunities, and the ability to navigate administrative and regulatory procedures (Estrin et al., 2024; Shahid et al., 2022). Evidence further suggests that formalization policies combining regulatory simplification with training, advisory services, digital support, and network development are more effective than reforms based solely on legal changes (Bruhn & McKenzie, 2014; Ngumkeu & Okou, 2021; Nguyen et al., 2014). Against this backdrop, this study aims to explore how digital skills influence formalization intention among informal entrepreneurs through entrepreneurial human capital and social capital.

Several studies offer related insights into IE and formalization. For instance, Bravo-Ortega et al. (2024) examine current formalization as a binary outcome shaped by institutional incongruence and moderated by the size of the informal business. Shahid et al. (2022), in turn, link formalization intention to the willingness to obtain a local license and tax registration, emphasizing tax morale as a mediating mechanism through which institutional failures influence formalization-related decisions. Our study differs from these approaches by shifting the analytical focus from institutional failures and current registration outcomes to entrepreneurs' digital, human, and social capital, and to how these resources shape the *ex ante* intention to formalize.

Moreover, our study adopts an exploratory approach by conceptualizing formalization as an intention-driven evaluation shaped by individual and relational resources in increasingly digitalized environments. Rather than assuming that digitalization or simplified digital registration procedures automatically lead informal entrepreneurs toward formalization, the study examines whether digital skills operate through heterogeneous pathways. Specifically, digital skills may facilitate engagement with formal systems, but they may also be associated with entrepreneurial human capital that makes informal operation more viable. In this way, the study contributes to informal entrepreneurship and technology management by showing that digital capabilities may have ambivalent implications for formalization in contexts where informal activity remains socially embedded, economically adaptive, and institutionally tolerated. Practically, the findings suggest that formalization policies should combine digital public services, capability development, bridging social capital, and concrete benefits of registration, rather than relying only on digital access or procedural simplification.

2. Theoretical Framework and Hypotheses

2.1. Formalization intention in informal entrepreneurship

Formalization refers to the process through which informal businesses enter the regulated economy by complying with legal, fiscal, labor, and administrative requirements. Through formalization, ventures may gain access to legal recognition, financial services, public goods, broader markets, formal contracts, and institutional support that can enhance entrepreneurial growth and stability (Cho & Honorati, 2014; Eckhardt & Shane, 2003; Williams & Shahid, 2016).

Despite these potential benefits, formalization is neither automatic nor universal among informal entrepreneurs. Many ventures operate outside the legal system while maintaining social legitimacy within their communities. Webb et al. (2009) argue that businesses may be perceived as legitimate even without official registration because legitimacy is grounded in socially constructed norms, values, and beliefs (e.g., Suchman, 1995). Scott (2013) distinguishes between regulatory legitimacy, based on compliance with formal rules; normative legitimacy, grounded in shared values; and cognitive legitimacy, rooted in taken-for-granted cultural assumptions. In informal settings, normative and cognitive legitimacy may partially compensate for the absence of regulatory legitimacy (Godfrey, 2011; Webb et al., 2009).

Because formalization involves an intentional act, it has often been conceptualized through behavioral theories. The Theory of Planned Behavior (Ajzen, 1991) proposes that behavior is preceded by intention, which is shaped by attitudes, subjective norms, and perceived behavioral control. In entrepreneurship, intention has been associated with entrepreneurial behavior (Krueger et al., 2000; Liñán & Chen, 2009). Accordingly, formalization intention can be understood as the willingness to register a business and comply with legal requirements, linking informal activity with potential formal economic participation (Nguyen et al., 2014; Rivera Huerta, 2017; Williams et al., 2017).

Informal entrepreneurs often evaluate the costs and benefits of formalization when deciding whether to register their businesses. Costs may include registration fees, bureaucratic complexity, taxes, and compliance with labor and safety standards (Amin & Islam, 2015; Demenet et al., 2016; Fajnzylber et al., 2009; Misganaw et al., 2023). Remaining informal, however, may provide lower operating costs and greater flexibility (Blunch & Raju, 2001; Darbi et al., 2018; Godfrey, 2011). At the same time, prolonged informality may increase evasion costs by exposing ventures to enforcement and sanctions and by limiting growth and access to formal markets (Amin & Islam, 2015; Fajnzylber et al., 2009; Misganaw et al., 2023).

The decision to formalize is also shaped by institutional conditions. Weak governance, corruption, unclear procedures, and bureaucratic opacity may increase transaction costs and encourage entrepreneurs to remain informal (Afreh et al., 2019; Perry, 2007; Williams & Kadir, 2019). Conversely, better governance and simplified procedures have been associated with higher levels of formalization (Nguimkeu & Okou, 2021; Thai & Turkina, 2014; Webb et al., 2014). However, formalization cannot be understood solely as a response to institutional

incentives. Entrepreneurs may remain informal not only because of external barriers, but also because informality can represent a rational and sometimes economically advantageous equilibrium (Misganaw et al., 2023; Sutter et al., 2017). These evaluations are shaped by entrepreneurs' digital skills, entrepreneurial human capital, relational resources, and perceptions of institutional opportunities.

2.2. Digital skills and IE

Digitalization has become increasingly relevant in entrepreneurship research because it reshapes how firms coordinate activities, access resources, interact with stakeholders, and create value across institutionally diverse environments (Shabbir & Salman, 2026; Uyar et al., 2021). In IE, digital technologies may provide alternative mechanisms for market participation, transaction coordination, reputational signaling, and opportunity creation under weak or fragmented formal institutions (Meagher, 2021; Shabbir & Salman, 2026).

Digitalization can be conceptualized as the integration of digital infrastructures, financial technologies, communication systems, and online platforms that enable access to payments, savings, credit, information, and digitally mediated exchanges (Boitan & Ștefoni, 2023). This process includes mobile technologies, e-commerce, social media, digital finance, and platform-based systems that increasingly shape entrepreneurial practices and economic organization (Senyo et al., 2023). Research further suggests that digitalization may, in some contexts, blur the boundaries between formality and informality by enabling hybrid business models that operate across formal and informal arrangements (Shabbir & Salman, 2026; Weber et al., 2021; Chen & Qiu, 2019).

Within this context, digital skills refer to entrepreneurs' general and business-oriented capabilities to use digital technologies to access information, identify opportunities, manage transactions, coordinate networks, and sustain business activities in digitalized economies (Cieslik et al., 2022; Daramola & Etim, 2022). These skills are relevant in IE because they may help entrepreneurs interact with customers, use digital financial tools, engage with online or platform-based markets, and access digital public services, while not necessarily implying compliance with formal regulations.

2.3. Human Capital in IE

Human capital includes education, skills, experience, and accumulated knowledge that shape productivity, adaptability, and decision-making (Subramaniam & Youndt, 2005). In IE, these forms of capital may influence how entrepreneurs understand regulations, process information, evaluate institutional requirements, and assess the potential benefits of legal protection, finance, formal contracts, market access, and institutional support (Autio & Fu, 2015; Davidsson & Honig, 2003).

Human capital may also enhance productivity, growth orientation, and strategic evaluation, making formalization more viable for entrepreneurs seeking to expand beyond subsistence activities into more structured operations (Estrin et al., 2024; Sutter et al., 2017; Maloney, 2004). In addition, it may reduce informational and administrative

barriers by helping entrepreneurs understand registration procedures, tax obligations, regulatory requirements, and available support programs (Shahid et al., 2022; Aidis et al., 2012; Perry, 2007).

From an institutional perspective, education, experience, and accumulated knowledge may shape how entrepreneurs interpret legitimacy, compliance, and the trade-offs between the flexibility of informality and the benefits of formal recognition (Siqueira et al., 2016; De Castro et al., 2014; Webb et al., 2014, 2009). However, human capital does not necessarily lead to formalization. Accumulated knowledge, routines, and experience may also reinforce stable informal arrangements when entrepreneurs can sustain profitable activities outside the legal framework (Rivera Huerta, 2017; Sutter et al., 2017). Consequently, entrepreneurs with stronger human capital may be better positioned to identify institutional opportunities and consider formalization as a strategic path for business development, whereas limited human capital may restrict access to formal institutions and more productive markets (Meagher, 2015; Dau & Cuervo-Cazurra, 2014; La Porta & Shleifer, 2014).

2.4. Social Capital in IE

Social capital refers to resources embedded in relationships, including trust, shared norms, access to information, and network-based support (Portes et al., 1989). In IE, social networks may serve as mechanisms for coordination, trust, and resource access when formal institutions are weak or difficult to reach (Khavul et al., 2013; Granovetter, 1985). Through these networks, informal entrepreneurs may obtain customers, suppliers, informal credit, labor, information, advice, and emotional support, helping them sustain entrepreneurial activity under conditions of institutional scarcity (Müller, 2017; Viswanathan et al., 2014; Ramirez & Hondagneu-Sotelo, 2009).

Social capital may also shape formalization-related evaluations. Broader or more diverse networks can connect entrepreneurs to information channels, organizations, and actors closer to formal markets and institutions. Such ties may reduce uncertainty, improve knowledge of legal requirements, and facilitate access to programs that support formalization (Siqueira et al., 2016; Pasquier-Doumer, 2013). At the same time, social capital may reinforce informal arrangements when trust-based relations, shared norms, and established routines reduce the perceived need to formalize or make informal operation sufficiently stable and legitimate within the entrepreneur's immediate environment (Rivera Huerta, 2017; Sutter et al., 2017).

2.5. Hypotheses Development

2.5.1. Digital Skills and formalization intention

Digital skills may shape formalization intention by reducing informational barriers, facilitating interaction with digital public services, and supporting more structured business practices. As governments increasingly rely on online registration systems, electronic tax platforms, and digital public services, the ability to navigate digital environments becomes more salient for engagement with formal institutions (Xheneti et al., 2019; Williams, 2007). These competencies and familiarity with digital technologies may facilitate access to information, interaction with

digital administrative systems, and the adoption of practices such as e-payments, mobile banking, digital record-keeping, and e-commerce tools (Silupu et al., 2022; Nguimkeu & Okou, 2021).

However, the relationship between digital skills and formalization intention remains theoretically ambiguous. Informal entrepreneurs may also use digital technologies to support commercial activities and market access without complying with formal regulations. Digital platforms may reduce communication and coordination constraints, allowing informal entrepreneurs to organize activities more efficiently under institutional instability and regulatory ambiguity (Shabbir & Salman, 2026; Daramola & Etim, 2022). In practice, entrepreneurs increasingly rely on social media, messaging applications, mobile banking, and e-commerce tools to reach customers, promote products, and coordinate transactions outside traditional formal channels (Shabbir & Salman, 2026). Platforms such as Facebook Marketplace, WhatsApp Business, and TikTok Shop have become accessible channels for promotion, customer engagement, and income generation, particularly for small-scale entrepreneurs (Shabbir & Salman, 2026). Mobile connectivity and digital financial services have also expanded financial inclusion and participation in platform-based markets (Cieslik et al., 2022; Kim, 2022; Saleh, 2021).

At the same time, digital skills may facilitate innovation, business model adaptation, and access to digitally enabled opportunities (Makate et al., 2019; Foster, 2014), while also strengthening entrepreneurial human capital, financial inclusion, and potential pathways toward formalization (Boitan & Ștefoni, 2023; Berniell, 2021; Mukorera, 2019). Yet digital transformation remains uneven. Limited digital skills, unequal connectivity, and technological asymmetries may restrict participation in digital markets and reproduce exclusionary dynamics within IE (Shabbir & Salman, 2026; Ebrahim & Van Den Berg, 2024; Oteng et al., 2024). Digitalization may also create new vulnerabilities, including platform dependency, unstable digital labor conditions, tax enforcement challenges, and digitally enabled shadow activities (Boitan & Ștefoni, 2023). Consequently, digital skills may be associated with formalization intention, but their effects are likely to depend on how entrepreneurs use digital tools within specific institutional and market conditions.

H1: Digital skills are associated with formalization intention among informal entrepreneurs.

2.5.2. Entrepreneurial human capital and formalization intention

Human capital theory argues that education, knowledge, experience, and accumulated skills increase productivity, adaptability, and the quality of entrepreneurial decision-making. In entrepreneurship, these resources enable individuals to evaluate opportunities, interpret institutional conditions, and mobilize resources under uncertainty (Acs et al., 2007). However, in informal entrepreneurship contexts, human capital should not be understood only through broad indicators such as years of formal education, but also through situated knowledge, practical experience, and specific preparedness to develop an economic activity (Engström & McKelvie, 2017; Ghore et al., 2023).

In this study, entrepreneurial human capital is understood as entrepreneurs' educational background, business-related specialization, and prior experience in starting or running a business (Huang et al., 2012). These resources may influence formalization intention because they shape how entrepreneurs evaluate risks, opportunities, and strategic alternatives in contexts where informality remains socially legitimate and economically viable (Estrin et al., 2024; Adbi & Shukla, 2023; Shahid et al., 2022; Dedehouanou & Araar, 2020). They may also help informal entrepreneurs understand regulatory requirements, assess costs and benefits, identify institutional opportunities, and anticipate the implications of remaining informal or moving toward formality (Jiménez et al., 2015; Williams & Shahid, 2016). In this regard, Wei et al. (2023) suggest that human capital can strengthen entrepreneurs' ability to cope with institutional fragility, access resources, and build legitimacy, which may affect how they assess the strategic value of formalization. However, this relationship may be ambivalent. In informal settings, experience and accumulated learning may also strengthen adaptation, improvisation, and the viability of informal or hybrid business models, particularly when formalization does not offer sufficient perceived benefits (Afutu-Kotey & Gough, 2022; Bolboacă et al., 2026).

H2: Entrepreneurial human capital is associated with formalization intention among informal entrepreneurs.

2.5.3. Social capital and formalization intention

Social capital may influence formalization intention by shaping entrepreneurs' access to information, support, and institutionally relevant contacts. In contexts where formal institutions are weak, inaccessible, or mistrusted, social networks may become important mechanisms for coordination, trust, and resource mobilization (Granovetter, 1985; Khavul et al., 2013). These networks may provide access to customers, suppliers, informal credit, labor, advice, information, and emotional support, thereby sustaining venture creation and survival under conditions of institutional scarcity (Müller, 2017; Ramirez & Hondagneu-Sotelo, 2009; Viswanathan et al., 2014).

Beyond immediate resource provision, social networks can connect entrepreneurs to new information channels, organizations, and actors closer to formal markets and institutions. Such ties may reduce uncertainty, improve knowledge of legal requirements, and facilitate access to programs that support formalization (Pasquier-Doumer, 2013; Siqueira et al., 2016). However, the role of social capital may also be ambivalent. Highly embedded networks may reinforce informal arrangements when trust-based relations, shared norms, and established routines reduce the perceived need to formalize (Meagher, 2015). By contrast, broader and more diverse forms of social capital may increase exposure to formal opportunities, institutional information, and market actors, thereby shaping entrepreneurs' willingness to move toward formality under certain conditions (Kloosterman et al., 1999).

H3: Social capital is associated with formalization intention among informal entrepreneurs.

2.5.4. The mediating roles of entrepreneurial human capital and social capital

Digitalization has rapidly evolved and permeated multiple spheres of economic and social life (Verhoef et al., 2021). In entrepreneurial activity, this transformation has made digital knowledge and digital capabilities increasingly relevant for entrepreneurs, including those operating informally and under resource constraints (Afutu-Kotey & Gough, 2022). In the digital age, entrepreneurs are increasingly required to access, evaluate, and use digital information sources, as digitalization reshapes their information-seeking behavior and the ways in which they acquire knowledge, identify opportunities, conduct business activities, and mobilize resources (Orrensalo et al., 2024). Within this broader context, Wang et al. (2021) conceptualize digital skills as part of digital competence, referring to individuals' ability to use digital technologies for task performance, problem-solving, communication, and engagement in digital environments. Accordingly, in this study, digital skills are understood as a bounded, business-oriented digital capability that reflects informal entrepreneurs' perceived confidence, familiarity, and ability to use digital tools for business improvement and problem-solving, rather than advanced technological expertise or sophisticated digital transformation capabilities. This distinction is important because, among informal entrepreneurs, digital engagement may involve incremental and practical uses of digital tools - such as mobile platforms, social media, digital marketplaces, and digital payment systems - that support information access, market visibility, customer interaction, and business improvement without necessarily implying sophisticated digital transformation or formal registration (Yáñez-Valdés et al., 2026; Afutu-Kotey & Gough, 2022; Aránega et al., 2024).

Digital skills, therefore, should not be assumed to translate automatically into formalization intention. At the firm level, Heredia et al. (2022) show that digital capabilities do not necessarily improve performance directly; rather, their effect operates through technological capabilities that help firms convert digital resources into performance-related outcomes. By extension, in informal entrepreneurship, digital skills may operate through complementary individual and relational resources that shape how entrepreneurs access information, learn from digital environments, communicate with stakeholders, and evaluate opportunities for business upgrading and formalization (Orrensalo et al., 2024; Yáñez-Valdés et al., 2026). Thus, digital skills may influence formalization intention indirectly through two complementary pathways: an individual pathway related to entrepreneurial human capital and a relational pathway related to social capital.

Entrepreneurial human capital may mediate this relationship because digital skills become more consequential when they are filtered through entrepreneurs' educational background, business-related specialization, and prior entrepreneurial experience (Engström & McKelvie, 2017; Ghore et al., 2023; Orrensalo et al., 2024). Entrepreneurs with stronger entrepreneurial human capital may be better positioned to interpret digital information, identify opportunities, understand regulatory requirements, and evaluate whether formalization represents a strategically valuable pathway for business upgrading (Jiménez et al., 2015; Williams & Shahid, 2016; Wei et al., 2023).

However, this mechanism may also operate ambivalently. In informal settings, accumulated experience and business knowledge may enable entrepreneurs to use digital tools to reduce search costs, reach customers, and improve their activities without necessarily formalizing (Afutu-Kotey & Gough, 2022; Yáñez-Valdés et al., 2026). Thus, entrepreneurial human capital may explain why digital skills support formalization-oriented evaluations for some informal entrepreneurs while reinforcing viable informal or hybrid arrangements for others.

Social capital may also mediate the relationship between digital skills and formalization intention. In informal entrepreneurship, relational resources are particularly relevant because entrepreneurs often rely on trusted ties, community-based networks, and relational spaces to access customers, suppliers, advice, support, and institutionally relevant information when formal institutional channels are weak, costly, or difficult to reach (Viswanathan et al., 2014; Zapata Campos et al., 2022; Shabbir & Salman, 2026). Digital skills can extend these relational resources by enabling entrepreneurs to maintain communication with customers and suppliers, participate in digitally mediated networks, access online communities, and connect with actors beyond their immediate local environment (Aránega et al., 2024; Rangaswamy, 2019; Irwin et al., 2025). In this sense, digital tools do not replace embedded trust; rather, they may broaden and reconfigure the networks through which informal entrepreneurs gain market visibility, reputational signals, institutional information, and exposure to for-

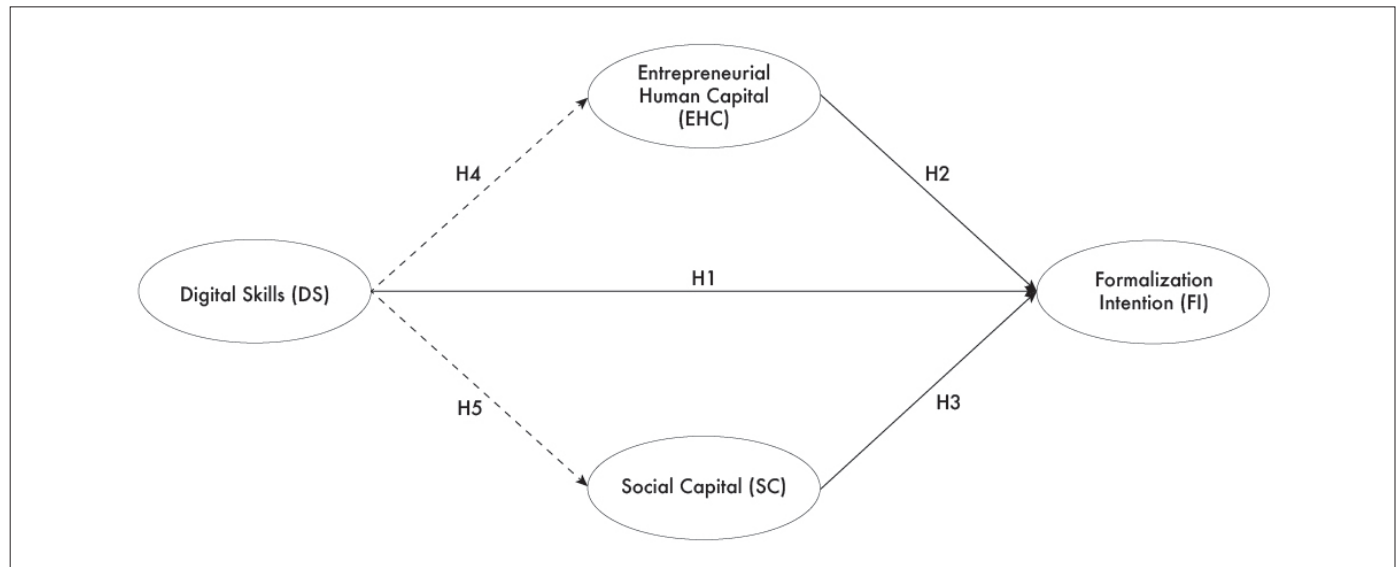
malization opportunities (Afutu-Kotey & Gough, 2022; Yáñez-Valdés et al., 2026). However, this pathway may also operate ambivalently: while digitally enabled ties may connect entrepreneurs to formal markets, support organizations, and institutional actors, they may also sustain informal or hybrid arrangements when online platforms, social media, and digital payment systems provide access to customers and resources without requiring registration. Thus, social capital is expected to function as a relational mechanism through which digital skills shape entrepreneurs' exposure to formalization opportunities and their evaluation of whether formalization is strategically valuable.

The preceding discussion suggests that digital skills may shape formalization intention through distinct individual and relational mechanisms. Entrepreneurial human capital may influence how informal entrepreneurs interpret digital resources and assess the strategic value of formalization, whereas social capital may shape their exposure to institutional information, formal market opportunities, and legitimacy-building pathways. Accordingly, we propose the following mediation hypotheses:

H4: Entrepreneurial human capital mediates the relationship between digital skills and formalization intention among informal entrepreneurs.

H5: Social capital mediates the relationship between digital skills and formalization intention among informal entrepreneurs.

Figure 1. Theoretical research model



3. Methodology

3.1. Sample and data collection

Data were collected through a self-administered online questionnaire between April and June 2025. Given the hidden and hard-to-reach nature of informal entrepreneurship, a non-probabilistic snowball sampling strategy was employed (Atkinson & Flint, 2001; Kirchherr & Charles, 2018). The survey yielded 528 responses, of which 383 were retained after excluding incomplete or inconsistent cases.

The adequacy of the final sample size was assessed according to the complexity of the proposed model and the power and precision criteria recommended for PLS-SEM analyses (Hair et al., 2019; Kline, 2023; Westland, 2015). In addition, following Halabí & Mora-Esquivel (2017), a minimum of 290 observations was required for factor analysis, a threshold exceeded by the final sample.

Table 1. Measures, reliability and validity

Description	Standardized Factor Loadings
Formalization Intention ($\alpha = 0.98$; CR = 0.98; AVE = 0.96)	
...I am willing to do what is necessary to formalize my business (i.e., legally register it and comply with regulations).	0.978
...My goal is to formalize my business.	0.984
...I will do everything possible to formalize and run my own business.	0.986*
...I am determined to formalize my business in the future.	0.985*
...I've seriously considered formalizing my business.	0.978
...I have a strong intention to formalize my business someday.	0.984
Entrepreneurial Human Capital ($\alpha = 0.89$; CR = 0.89; AVE = 0.81)	
...I have the right specialization and educational background for my business.	0.908
...I have the experience to successfully run a business.	0.921
...I have adequate experience with the business career.	0.847
...I had no business experience before starting this venture.**	0.275*
Digital Skills ($\alpha = 0.94$; CR = 0.96; AVE = 0.76)	
...I am confident in my ability to apply digital technologies to improve my business.	0.884
...I regularly reflect on how to enhance my business with digital tools.	0.884
...I can find solutions to problems that arise in my business using digital tools.	0.907
...I am comfortable viewing information on a screen with focus.	0.814
...I am comfortable watching videos with focus.	0.794
...I am comfortable using digital tools.	0.900
...I clearly define how I will use digital technologies in my business.	0.898
Social Capital ($\alpha = 0.98$; CR = 0.98; AVE = 0.94)	
...I am part of many social groups (entrepreneur groups, associations, working groups, etc.) that benefit my business.	0.959
...I share a common goal with my social groups.	0.975
...My social groups are characterized by trust and mutual respect among their members.	0.980
...Members of my social groups can exchange information honestly.	0.978

Source: Prepared by the authors based on the data analyzed.

Note: α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted. * Items excluded from the final measurement model. In Formalization Intention, items were excluded due to conceptual redundancy and high inter-item overlap; in Entrepreneurial Human Capital, the reverse-coded item was excluded due to low factor loading. **Reverse-coded item.

3.2. Variables and measures

The questionnaire included reflective constructs and single-indicator control variables. All scales used a five-point Likert format, were adapted to the context of informal entrepreneurs, translated into Spanish, and reviewed by three researchers following the conceptual equivalence procedure of Sousa & Rojjanasirirat (2011), ensuring translation fidelity, semantic adequacy, and cultural relevance. Formalization intention was initially measured with six items adapted from Liñán & Chen (2009). After measurement-model refinement, four items were retained, with two highly overlapping items removed to improve parsimony while preserving the substantive meaning of the construct. Social capital was assessed using four items adapted from Huang et al. (2012). Digital skills were measured using seven indicators adapted from Wang et al. (2021). Entrepreneurial human capital was initially measured using four items adapted from Huang et al. (2012), capturing educational background, business-related specialization, and prior entrepreneurial experience; three items were retained after excluding one reverse-coded item with a low loading.

In all cases, the retained external loadings exceeded 0.70, meeting the recommended criteria for reflective measurement models. Years of schooling, business age, age, and gender were included as control variables. Gender was coded as 0 = female and 1 = male, with women representing 55% of the sample. Table 1 presents the external loadings and reliability indicators.

3.2. Analysis method

Statistical analysis was conducted using PLS-SEM, a suitable approach for predictive models with complex structures and less restrictive assumptions regarding multivariate normality (Benitez et al., 2020; Hair et al., 2019). The PLS algorithm was estimated using a path weighting scheme, and bootstrapping with 10,000 subsamples was applied to obtain standard errors, t-values, and significance levels. Model assessment included evaluation of the reflective measurement model, examination of the structural model, and analysis of out-of-sample predictive power using PLSpredict.

Table 2. Descriptive statistics, correlations, and discriminant validity

Characteristic	Mean	SD	1	2	3	4	5	6	7	8
1. Formalization Intention	2.06	1.56	0.98	0.26	0.14	0.04	0.28	0.18	0.42	0.44
2. Entrepreneurial Human Capital	4.42	1.02	-0.24	0.90	0.36	0.32	0.15	0.12	0.09	0.25
3. Digital Skills	4.08	1.40	0.06	0.36	0.87	0.27	0.31	0.09	0.34	0.16
4. Social Capital	3.84	1.56	-0.03	0.30	0.28	0.97	0.15	0.08	0.03	0.25
5. Age	42.57	13.91	-0.27	0.15	-0.27	0.15	1.00	0.03	0.53	0.61
6. Gender *	0.45	0.49	-0.17	0.12	0.08	-0.08	0.03	1.00	0.05	0.15
7. Years of Schooling	12.29	3.80	0.42	-0.09	0.31	-0.01	-0.53	-0.05	1.00	0.42
8. Business Age	6.71	4.00	-0.43	0.24	-0.11	0.25	0.61	0.15	-0.42	1.00

Source: Prepared by the authors based on the data analyzed.

Notes: SD = standard deviation. Bold diagonal values report the square roots of the average variance extracted (AVE) for reflective constructs and 1.00 for single-indicator control variables. Off-diagonal elements below the diagonal are correlations among the variables. Off-diagonal elements above the diagonal report HTMT values for pairs of reflective constructs; for relationships involving single-indicator controls, absolute correlations are reported. * Gender was coded as 1 = male and 0 = female; therefore, the mean represents the proportion of men in the sample.

4. Results

4.1. Evaluation of the measurement model

The retained indicators showed external loadings above 0.70, supporting adequate individual indicator reliability. Internal consistency measures (α , ρ_A , and composite reliability) exceeded the recommended threshold of 0.70 for all reflective constructs. The average variance

extracted (AVE) was above 0.50, supporting convergent validity. Discriminant validity was assessed using the HTMT and Fornell–Larcker criteria. HTMT values among reflective constructs remained below 0.85, and the square root of the AVE for each construct was higher than its correlations with the other constructs (Hair et al., 2019; Henseler et al., 2015). These results are summarized in Tables 1, 2, and 3.

Table 3. Explanatory power, effect sizes, and collinearity statistics

Variables	R ²	R ² Adj.	Effect Size f^2				Variance Inflation Factor Inner Model			
			1	2	3	4	1	2	3	4
1. Formalization Intention	0.30	0.28								
2. Entrepreneurial Human Capital	0.22	0.21	0.03			0.03	1.32			1.29
3. Digital Skills	-	-	0.00	0.20		0.06	1.47	1.15		1.38
4. Social Capital	0.20	0.19	0.01				1.25			

Source: Prepared by the authors based on the data analyzed.

Note: R² and adjusted R² are reported for endogenous constructs. Effect sizes (f^2) and variance inflation factors (VIF) are reported for the inner model. Rows indicate predictor variables and columns indicate endogenous variables. Blank cells indicate that no structural path was specified. Digital skills is an exogenous construct; therefore, R² is not applicable.

4.2. Evaluation of the structural model

The structural model was evaluated in terms of inner-model collinearity, effect sizes, explanatory power, and coefficient significance. VIF values ranged from 1.15 to 1.47, below the threshold of 3, indicating no relevant collinearity concerns. Regarding explanatory power, Formalization Intention reached an R² of 0.30, Entrepreneurial Human Capital an R² of 0.22, and Social Capital an R² of 0.20. Thus, the model explains approximately 30% of the variance in formalization intention. The f^2 effect sizes, detailed in Table 3, suggest that the explanatory contribution of the predictors ranges from small to moderate. Digital Skills presents a moderate effect on Entrepreneurial Human Capital, whereas the remaining effects are relatively small.

To assess common method bias, Kock's (2017) full collinearity approach and Harman's single-factor test were applied (Podsakoff et al., 2003). Full collinearity VIFs were below 3.3, and Harman's test yielded 32.67% explained variance, below the suggested 50%

threshold, indicating a low probability that a single factor explains the covariances. In addition, procedural remedies were implemented, including anonymity and the clarification that there were no correct or incorrect answers (Podsakoff et al., 2003). Given the possibility of unobserved heterogeneity, FIMIX-PLS was also applied, identifying two balanced segments with no significant differences, which supports the overall homogeneity of the effects (Henseler et al., 2009; Sarstedt et al., 2017).

Finally, the model's predictive power was evaluated using PLSpredict by comparing the prediction error of the PLS model with a multiple linear regression benchmark (Hair et al., 2019; Henseler et al., 2016). The Q²predict values for the key indicators were positive, ranging from 0.114 to 0.259, indicating satisfactory predictive power. The RMSE and MAE values of the PLS model were comparable to or lower than those of the linear model, as shown in Table 4, supporting the model's predictive relevance (Shmueli et al., 2019).

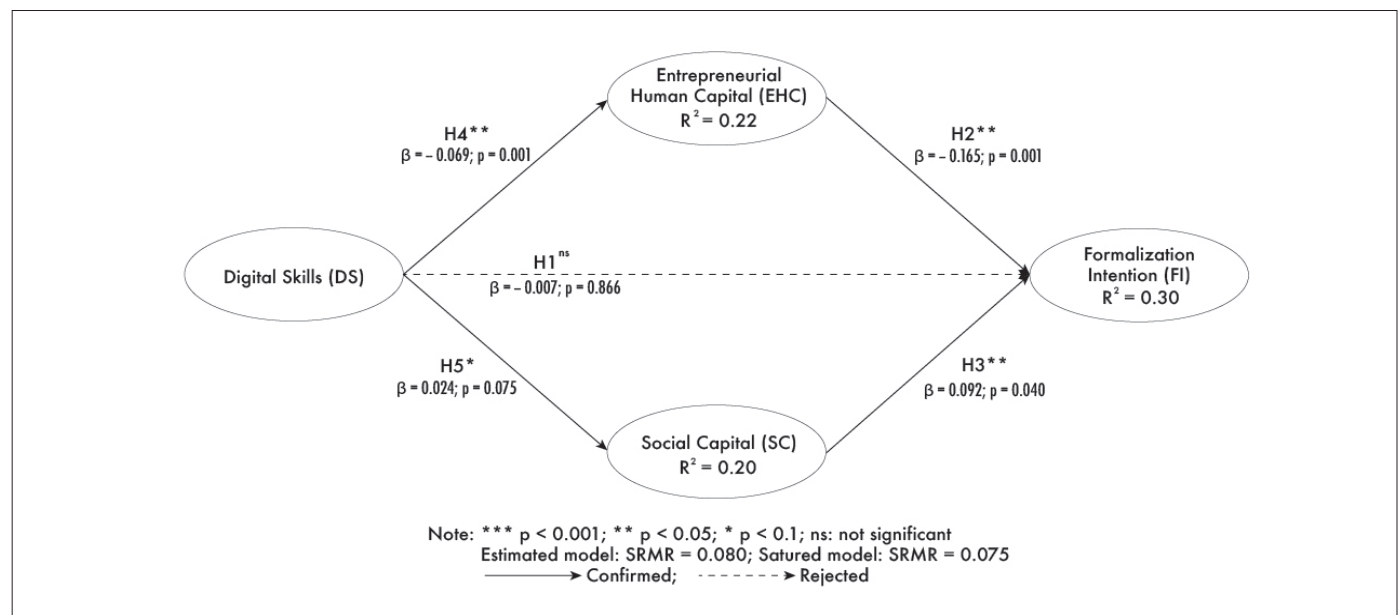
Table 4. Indicators of the model's predictive power

PLSpredict LV		PLSpredict MV				
Latent Construct	LM Predict	Item	Q ² predict	PLS-SEM_MAE	LM_MAE	A_MAE
Formalization Intention	0.267	ForInt_1	0.259	1.037	1.029	1.348
		ForInt_2	0.258	1.076	1.088	1.412
		ForInt_5	0.256	1.119	1.118	1.462
		ForInt_6	0.257	1.109	1.109	1.450
Entrepreneurial Human Capital	0.192	EHuCa_1	0.166	0.618	0.613	0.768
		EHuCa_2	0.178	0.507	0.501	0.625
		EHuCa_3	0.126	0.859	0.857	1.020
		SocCap_1	0.180	1.252	1.140	1.436
Social Capital	0.157	SocCap_2	0.159	1.211	1.129	1.369
		SocCap_3	0.114	1.183	1.138	1.304
		SocCap_4	0.132	1.181	1.130	1.326

Source: Prepared by the authors based on the data analyzed.

The path coefficients show mixed results. Digital Skills has no direct effect on Formalization Intention ($\beta = -0.007$, $p = 0.866$); therefore, H1 is not supported. Entrepreneurial Human Capital is ne-

gatively and significantly associated with Formalization Intention ($\beta = -0.165$, $p = 0.001$), supporting H2. Social Capital is positively and significantly related to Formalization Intention ($\beta = 0.092$, $p = 0.040$), supporting H3 (see Table 5).

Figure 2. Structural model with empirical results

Regarding indirect effects, the pathway Digital Skills → Entrepreneurial Human Capital → Formalization Intention is negative and significant ($\beta = -0.069$, $p = 0.001$), supporting H4. This result indicates that digital skills are indirectly associated with lower formalization intention through their positive relationship with Entrepreneurial Human Capital and the negative association between Entrepreneurial Human Capital and Formalization Intention. The pathway Digital Skills → Social Capital → Formalization Intention is positive but only marginally significant at the 10% level ($\beta = 0.024$, $p = 0.075$), providing partial support for H5.

With respect to control variables, Age shows a positive and marginally significant relationship with Formalization Intention ($\beta = 0.107$, $p = 0.070$). Gender has a negative and significant effect ($\beta = -0.172$, $p = 0.049$), indicating that men report lower Formalization Intention than women, given that Gender was coded as 1 = male and 0 = female. Years of Schooling is positively and significantly associated with Formalization Intention ($\beta = 0.317$, $p < 0.001$), whereas Business Age shows a negative and significant effect ($\beta = -0.336$, $p < 0.001$). These results are illustrated in Figure 2.

Table 5. Significance analysis of the structural model relationships.

Paths	Path Coefficients					Total Effects			
	P – Value	Original Sample	T–Statistic	2.5%	97.5%	Original Sample	T – Statistic	2.5%	97.5%
Hypothesized Direct Effects									
H1: DS → FI	0.866	-0.007	0.169	-0.098	0.075	-0.048	1.117	-0.133	0.033
H2: EHC → FI	0.001	-0.165	3.363	-0.260	-0.068	-0.150	3.090	-0.243	-0.054
H3: SC → FI	0.040	0.092	2.051	0.003	0.180	0.092	2.051	0.003	0.180
Other non-hypothesized Direct Effects									
EHC → SC	0.004	0.164	2.885	0.053	0.276	0.164	2.885	0.053	0.276
DS → SC	0.000	0.258	4.156	0.137	0.378	0.329	6.276	0.227	0.433
AG → FI	0.070	0.107	1.809	-0.010	0.222	0.098	1.633	-0.023	0.214
AG → EHC	0.068	0.110	1.823	-0.010	0.228	0.110	1.823	-0.010	0.228
AG → SC	0.151	0.089	1.437	-0.037	0.206	0.107	1.698	-0.020	0.226
GE → FI	0.049	-0.172	1.971	-0.340	0.001	-0.215	2.494	-0.382	-0.047
GE → EHC	0.234	0.103	1.190	-0.065	0.272	0.103	1.190	-0.065	0.272
GE → SC	0.001	-0.299	3.176	-0.480	-0.109	-0.282	2.935	-0.466	-0.093
YS → FI	0.000	0.317	5.747	0.206	0.424	0.336	6.088	0.225	0.443
YS → SC	0.247	0.062	1.159	-0.045	0.167	0.048	0.874	-0.061	0.153
BA → FI	0.000	-0.336	5.828	-0.449	-0.223	-0.340	6.169	-0.447	-0.231
BA → EHC	0.003	0.173	2.989	0.057	0.285	0.173	2.989	0.057	0.285
BA → SC	0.000	0.234	3.965	0.119	0.350	0.262	4.419	0.146	0.378
Hypothesized Indirect Effects									
H4: DS→ EHC → FI	0.001	-0.069	3.409	-0.110	-0.031				
H5: DS→ SC → FI	0.075	0.024	1.783	0.001	0.053				
Other non-hypothesized Indirect Effects									
AG → EHC → FI	0.151	-0.018	1.435	-0.048	0.001				
AG → SC → FI	0.269	0.008	1.105	-0.004	0.025				
GE → EHC → FI	0.282	-0.017	1.076	-0.052	0.011				
GE → SC → FI	0.093	-0.028	1.681	-0.065	-0.001				
YS → SC → FI	0.193	0.014	1.302	-0.006	0.039				
BA → EHC → FI	0.014	-0.029	2.447	-0.053	-0.008				
BA → SC → FI	0.091	0.022	1.690	0.001	0.051				

Source: Prepared by the authors based on the data analyzed.

Note: Results from 95 percent two-tailed testing bias-corrected and accelerated confidence intervals were derived from bootstrapping 10,000 samples using the no sign change option (see Streukens & Leroi-Werelds, 2016 which relies on bootstrapping in partial least squares structural equation modeling (PLS-SEM)). FI: Formalization Intention, EHC: Entrepreneurial Human Capital, DS: Digital Skills, SC: Social Capital, AG: Age, GE: Gender, YS: Years of Schooling, and BA: Business Age.

5. Discussion

The findings provide a nuanced interpretation of how digital skills relate to formalization intention among informal entrepreneurs. Rather than suggesting that digital skills automatically lead to formalization, the results indicate that their effect depends on how entrepreneurs combine and mobilize complementary resources within specific institutional contexts. This aligns with research showing that entrepreneurial action is embedded in social, economic, and institutional environments that simultaneously enable and constrain behavior (Zhu et al., 2019; Langevang et al., 2015). Accordingly, informal entrepreneurs

should not be viewed only as passive subjects of institutional barriers or policy incentives, but as actors exercising bounded entrepreneurial agency when evaluating the benefits, costs, risks, and legitimacy of formalization under constrained institutional conditions.

Formalization may provide access to certain benefits, including legal recognition, financial services, public goods, broader markets, formal contracts, and institutional support (Williams & Shahid, 2016; Cho & Honorati, 2014). However, these benefits may be offset by perceived costs and constraints that discourage formalization, including bureaucratic complexity, tax burdens, compliance requirements, and

the loss of flexibility associated with informal operation (Misganaw et al., 2023; Demenet et al., 2016; Amin & Islam, 2015). Thus, even when digital skills improve access to information and complementary resources, formalization intention is better understood as a strategic evaluation shaped – but not determined – by technological exposure, regulatory conditions, and institutional incentives (Shahid et al., 2022).

This interpretation aligns with research suggesting that institutional conditions influence, but do not fully determine, formalization decisions. Weak governance, corruption, unclear procedures, and bureaucratic opacity may increase transaction costs and encourage informality (Afreh et al., 2019; Williams & Kadir, 2019), whereas better governance and simplified procedures may facilitate formalization (Nguimkeu & Okou, 2021; Thai & Turkina, 2014; Webb et al., 2014). However, the persistence of informality despite reforms, incentives, and digitalization initiatives suggests that formalization also depends on entrepreneurs' expectations, capabilities, perceived risks, business trajectories, and embeddedness in local networks and institutional environments (Galdino et al., 2023; Bika et al., 2022; Shahid et al., 2022; La Porta & Shleifer, 2014).

Digital skills may enable informal entrepreneurs to use digital technologies as alternative mechanisms for market participation, transaction coordination, reputational signaling, and opportunity creation under weak or fragmented formal institutions (Shabbir & Salman, 2026; Meagher, 2021). Through digital tools such as online platforms, digital payment systems, social media, and e-government services, entrepreneurs may access market information, coordinate transactions, interact with customers, and engage with formal institutions (Boitan & Ștefoni, 2023; Senyo et al., 2023; Xheneti et al., 2019). However, the absence of a direct association suggests that digital skills alone do not necessarily increase formalization intention. The same tools that facilitate access to formal systems may also allow informal entrepreneurs to gain visibility, reach customers, and coordinate activities without full regulatory compliance (Cieslik et al., 2022; Daramola & Etim, 2022; Silupu et al., 2022; Nguimkeu & Okou, 2021). Thus, digitally skilled informal entrepreneurs may sustain hybrid digital–informal business models that expand market access while reducing the perceived need to register.

Contrary to expectations, entrepreneurial human capital was negatively associated with formalization intention. This finding should be interpreted in line with what the scale captures: educational background, business-related specialization, and prior entrepreneurial experience rather than operational managerial competence. From this perspective, entrepreneurs with stronger human capital may be better able to understand market conditions, evaluate institutional requirements, and compare the benefits and costs of formalization. However, these same resources may also help them sustain viable informal or hybrid arrangements when formalization does not offer sufficient perceived value (Rivera Huerta, 2017; Sutter et al., 2017). In contexts where informal ventures maintain social acceptance, trust-based exchanges, and community legitimacy despite lacking regulatory legitimacy, experienced entrepreneurs may perceive fewer strategic

reasons to formalize (Godfrey, 2011; Webb et al., 2009; Siqueira et al., 2016). This interpretation is consistent with evidence that informal entrepreneurs may develop situated knowledge, practical experience, and adaptive capabilities that allow them to operate under institutional constraints without necessarily moving toward full formalization (Afutu-Kotey & Gough, 2022; Engström & McKelvie, 2017; Ghore et al., 2023; Yáñez-Valdés et al., 2026).

On the other hand, social capital showed a positive and statistically significant, although modest, association with formalization intention. This finding suggests that, in informal entrepreneurship, networks may operate as relational channels through which entrepreneurs access information, reduce uncertainty, and become more familiar with legal requirements, support programs, and formal market expectations (Müller, 2017; Siqueira et al., 2016; Viswanathan et al., 2014; Khavul et al., 2013; Pasquier-Doumer, 2013). Social capital may therefore increase formalization intention when it connects entrepreneurs with legitimating audiences, institutional actors, support organizations, and formal market opportunities. However, this association should not be interpreted as uniform. Broader and more diverse networks may facilitate access to formal institutions and markets, whereas cohesive local networks may reinforce informal arrangements when trust-based relations, shared norms, and established routines reduce the perceived need to formalize (Rivera Huerta, 2017; Sutter et al., 2017). Thus, social capital appears to support formalization intention mainly when it expands entrepreneurs' relational exposure beyond local embeddedness and connects them to formal institutional environments.

The mediation findings further suggest that digital skills do not operate as a uniform driver of formalization intention. Their influence depends on the mechanism involved: a negative indirect effect through entrepreneurial human capital and a positive, although modest and marginally significant, indirect effect through social capital. This pattern is consistent with the mixed embeddedness perspective, which views informal entrepreneurs as operating within institutional environments that may simultaneously encourage formalization and sustain informality (Langevang et al., 2015). Digital tools may support registration, documentation, transaction records, and traceability, while also enabling entrepreneurs to access markets, coordinate activities, and sustain informal or hybrid operations when the perceived benefits of formalization are weak or uncertain (Daramola & Etim, 2022). Thus, digital skills may reduce formalization intention when combined with entrepreneurial human capital that makes informal operation more viable, but may also increase exposure to formal opportunities when embedded in broader social networks. This interpretation aligns with research suggesting that formal and informal trajectories may coexist and that informality can serve as a space for experimentation before entrepreneurs incur the costs of registration (Estrin et al., 2024; Maloney, 2004; Sutter et al., 2017).

The control variables provide additional insight into formalization intention. Years of schooling is positively associated with formalization intention, suggesting that education may enhance entrepreneurs' ability to understand institutional requirements, evaluate registration

benefits, and recognize opportunities linked to formal markets (Shahid et al., 2022; Williams & Shahid, 2016; Cho & Honorati, 2014). This contrasts with the negative association observed for entrepreneurial human capital, suggesting that general education and business-specific human capital may play different roles. While schooling may increase institutional literacy and openness to formalization, entrepreneurial human capital – capturing business-related specialization and prior experience – may strengthen entrepreneurs' perceived ability to sustain their activities within informal or hybrid arrangements. Gender also shows a negative association with formalization intention, indicating that men report lower formalization intention than women, although this result should be interpreted cautiously. Business age is also negatively associated with formalization intention, indicating that more established ventures may become increasingly embedded in routines, customer relationships, and local networks that reduce the perceived need to formalize. Thus, while education may increase openness to formalization, business-specific experience and venture maturity may strengthen the conditions that make continued informality appear manageable, legitimate, or economically preferable (Rivera Huerta, 2017; Sutter et al., 2017; Maloney, 2004).

6. Implications

Our study has implications for theory, practice, and public policy-makers alike. Theoretically, the findings contribute to the literature on informal entrepreneurship and digital transformation by challenging the assumption that individual digital skills operate as a direct or linear driver of formalization intention (Senyo et al., 2023; Meagher, 2021; Xheneti et al., 2019). Instead, digital skills acquire different meanings depending on the mechanisms through which they are mobilized. Entrepreneurial human capital may help entrepreneurs use digital resources to sustain viable informal or hybrid arrangements, whereas social capital may embed digital skills within relational structures that shape legitimacy, information flows, and exposure to formal institutional logics (Liu et al., 2019; Rivera Huerta, 2017; Sutter et al., 2017; Davidsson & Honig, 2003). In doing so, the study extends mixed embeddedness perspectives by showing that micro-level digital capabilities do not operate independently from the individual and relational contexts in which informal entrepreneurs evaluate the desirability and feasibility of formalization (Zhu et al., 2019; Langevang et al., 2015).

From a practical perspective, the findings suggest that support organizations, business associations, and training providers should not assume that digital or business-related capabilities automatically lead informal entrepreneurs toward formalization. Digital skills may help entrepreneurs access information, coordinate transactions, and interact with digital infrastructures, but they may also strengthen informal or hybrid operation when formalization offers limited perceived value (Silupu et al., 2022; Nguimkeu & Okou, 2021; Xheneti et al., 2019; Williams, 2007). Therefore, capability-building initiatives should connect digital training with concrete pathways to formal market access, digital public services, e-procurement, digital financial inclusion, legal protection, and innovation support ecosystems. These interventions should also be differentiated: nascent ventures

may require basic orientation, trust-building, and simplified access to registration systems, whereas established informal ventures may need stronger incentives to link digital tools with formal contracts, finance, and growth opportunities. Similarly, entrepreneurs with weaker networks may benefit from bridging mechanisms that connect them to institutional actors, while those with stronger networks may need support to transform relational resources into formal market opportunities.

At the policy level, the results indicate that digitalization and regulatory simplification, although necessary, are not sufficient to increase formalization intention. Digital public services may reduce administrative barriers, but they do not automatically make formalization attractive if entrepreneurs can continue operating flexibly outside full compliance. Policies should therefore increase the relative value of formality by linking registration to tangible benefits, such as digital financial inclusion, public procurement opportunities, formal contracts, legal protection, and access to innovation support ecosystems (Williams & Shahid, 2016; Cho & Honorati, 2014; Eckhardt & Shane, 2003). Platform registration and transaction traceability alone may have limited impact unless entrepreneurs associate them with concrete opportunities and support (Daramola & Etim, 2022). Thus, policy design should also address digital accessibility and institutional usability, since digital systems often require bank accounts, digital literacy, and knowledge of available opportunities, in addition to devices and basic digital skills (Keskinen et al., 2022). Accessible interfaces, low-literacy design, assisted registration, and public-private support mechanisms may therefore be especially important. More broadly, effective formalization policy should recognize the agency of informal entrepreneurs without romanticizing informality: formalization strategies should combine regulatory simplification, meaningful incentives, capability development, and network-based support.

7. Limitations and future lines of research

This study has several limitations. First, the dependent variable captures formalization intention rather than actual formalization behavior. Therefore, the findings should be interpreted as explaining entrepreneurs' willingness or predisposition to formalize, not whether they effectively register their businesses or sustain compliance over time. Future research could examine whether, when, and under what conditions formalization intentions translate into actual registration and sustained compliance.

Second, the interpretation of the constructs should be bounded by their operationalization. The Digital Skills scale captures confidence, familiarity, and general comfort with digital tools, rather than capabilities specifically related to digital public services, e-procurement, digital financial systems, or advanced digital transformation. Similarly, Entrepreneurial Human Capital captures educational background, business-related specialization, and prior entrepreneurial experience, rather than operational managerial competencies. This limitation is particularly relevant for interpreting its negative association with Formalization Intention. Future research could use more specific measures of entrepreneurial human capital in informal entrepreneurship,

including managerial experience, and digital financial literacy, while also examining other entrepreneur-level characteristics, such as personality traits, entrepreneurial background, among others (Anwar et al., 2020; Choung et al., 2023; Kumar et al., 2023; Lee & Tsang, 2001).

Third, the cross-sectional design restricts causal inference and prevents us from establishing the temporal ordering of the proposed mediation mechanisms. Although the model is theoretically grounded, the results should be interpreted as intention-based associations rather than definitive causal relationships. Longitudinal or panel designs would allow future studies to examine how digital skills, entrepreneurial human capital, social capital, and formalization intention evolve over time, particularly in contexts shaped by digitalization and regulatory change.

Fourth, the hidden and sensitive nature of informal entrepreneurship made snowball sampling a pragmatic strategy for accessing participants. Although appropriate for hard-to-reach populations, this approach limits statistical generalization; therefore, the findings should be interpreted as analytically rather than population-level generalizable. Future research could assess the robustness of the model using larger and more diverse samples across sectors, territories, and institutional contexts. In addition, reliance on self-reported measures may introduce perceptual or social desirability biases when examining legality, compliance, and informal business practices. Although common method bias checks and systematic response analyses did not suggest major concerns, the sensitive nature of the phenomenon requires interpreting the findings with appropriate caution.

Finally, although this study examines individual and relational factors, it does not explicitly incorporate contextual conditions such as governance quality, enforcement exposure, community norms, sectoral dynamics, or the perceived value of formal institutions. These conditions may shape whether entrepreneurs interpret formalization as desirable, feasible, or necessary. Future research could adopt comparative or multilevel designs to examine how contextual conditions influence the relationship between digital skills, entrepreneurial resources, and formalization outcomes.

8. Conclusions

This study concludes that formalization intention among informal entrepreneurs should not be understood as a direct or linear outcome of digital skills, regulatory simplification, or capability accumulation. Rather, it is associated with a strategic evaluation shaped by the interplay between practical digital skills, entrepreneurial human capital, social capital, and the perceived value of remaining informal versus becoming formal. Digital skills may facilitate access to information, digital public services, and formal market opportunities, but they may also support market access, transaction coordination, and informal or hybrid arrangements when formalization offers limited perceived benefits. In this sense, the findings suggest that digitalization does not automatically move informal entrepreneurs toward registration; its relevance depends on the individual and relational

resources through which digital skills are mobilized. The study therefore contributes to informal entrepreneurship and technology management by showing that digital tools can both connect entrepreneurs to formalization pathways and reinforce digitally enabled informality. Effective formalization strategies should combine accessible digital public services with tangible incentives, capability development, and trusted relational channels that make formal participation more attractive than remaining informal.

Acknowledgements

The authors gratefully acknowledge institutional support from their university, which was valuable for data collection and for the overall development of this research.

Ethical Statement

This study was reviewed and approved by the Scientific Ethics Committee of our university. The research was conducted in full compliance with internationally accepted ethical standards and in accordance with the principles of respect, justice, confidentiality, and anonymity. All participants were informed about the objectives and procedures of the study, their right to decline participation or withdraw at any time without consequences, and the measures adopted to protect their privacy and personal data. Written informed consent was obtained from all participants prior to data collection.

IA Declaration

The authors used artificial intelligence-based tools (including ChatGPT and Grammarly) exclusively to improve the language quality, clarity, and readability of the manuscript. All content generated or refined with the assistance of these tools was carefully reviewed and edited by the authors, who take full responsibility for the accuracy, originality, and integrity of the published work.

Integrity confirmation

The authors confirm that AI was NOT used to: (i) fabricate empirical data or results; (ii) generate references, DOIs or citations without independent verification at source — including DOIs that resolve to documents other than the cited work; (iii) substitute authorial judgment in the interpretation of findings; (iv) serve as a listed author; (v) introduce homograph substitution, hidden text or any other technical-obfuscation tactic. The authors retain full and exclusive scientific and ethical responsibility for the manuscript's content. Violation of these terms triggers the procedures of the JOTMI Responsible AI Use Policy and the Publication Integrity Protocol and Extended Retraction Policy.

Disclosure statement

The authors declare that they have no known financial or commercial interests that could have influenced the results or interpretation of this study. The research did not receive external funding from private entities that could give rise to a potential conflict of interest.

References

- Ackrill, R., & Igudia, E. (2023). Analysing the informal economy: Data challenges, research design, and research transparency. *Review of Development Economics*, 28(4), 1971-1993. <https://doi.org/10.1111/rode.13070>
- Acs, Z. J., Armington, C., & Zhang, T. (2007). The determinants of new-firm survival across regional economies: The role of human capital stock and knowledge spillover. *Papers in Regional Science*, 86(3), 367-392. <https://doi.org/10.1111/j.1435-5957.2007.00129.x>
- Adbi, A., & Shukla, D. (2023). Registration at founding and firm performance: Generalization and extension replication from global data. *Journal of International Business Studies*, 54(2), 365-384. <https://doi.org/10.1057/s41267-022-00532-8>
- Adegbile, A. S., Ogundana, O. M., & Adesola, S. (2024). Gender-based policies and women's entrepreneurship: An fsQCA analysis of sub-Saharan African countries. *International Journal of Entrepreneurial Behavior & Research*, 30(7), 1811-1837. <https://doi.org/10.1108/IJEBR-04-2023-0394>
- Afreh, B., Rodgers, P., Vershinina, N., & Williams, C. C. (2019). Varieties of context and informal entrepreneurship: Entrepreneurial activities of migrant youths in rural Ghana. *International Journal of Entrepreneurial Behavior & Research*, 25(5), 996-1013. <https://doi.org/10.1108/IJEBR-02-2018-0109>
- Afutu-Kotey, R. L., & Gough, K. V. (2022). Bricolage and informal businesses: Young entrepreneurs in the mobile telephony sector in Accra, Ghana. *Futures*, 135, 102487. <https://doi.org/10.1016/j.futures.2019.102487>
- Aidis, R., Estrin, S., & Mickiewicz, T. (2012). Size matters: entrepreneurial entry and government. *Small Business Economics*, 39(1), 119-139. <https://doi.org/10.1007/s11187-010-9299-y>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, Theories of Cognitive Self-Regulation*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Amin, M., & Islam, A. (2015). Are large informal firms more productive than the small informal firms? evidence from firm-level surveys in africa. *World Development*, 74(1), 374-385. <https://doi.org/10.1016/j.worlddev.2015.05.008>
- Anwar, M., Shuangjie, L., & Ullah, R. (2020). Business experience or Financial Literacy? Which one is better for opportunity recognition and superior performance? *Business Strategy & Development*, 3(3), 377-387. <https://doi.org/10.1002/bsd2.103>
- Aránega, A.Y., Montesinos, C.G, Castaño Urueña, R., & Castaño Sánchez, R. (2025). Digitalization intention in entrepreneurs and SMEs: A structural equation model of digital behavior and work-life balance. *International Entrepreneurship and Management Journal*. 21, 24. <https://doi.org/10.1007/s11365-024-01049-2>
- Atkinson, R., & Flint, J. (2001). Accessing hidden and hard-to-reach populations: Snowball research strategies. *Social research update*, 33(1), 1-4.
- Autio, E., & Fu, K. (2015). Economic and political institutions and entry into formal and informal entrepreneurship. *Asia Pacific Journal of Management*, 32(1), 67-94. <https://doi.org/10.1007/s10490-014-9381-0>
- Benitez, J., Henseler, J., Castillo, A., & Schuberth, F. (2020). How to perform and report an impactful analysis using partial least squares: Guidelines for confirmatory and explanatory IS research. *Information & management*, 57(2), 103168. <https://doi.org/10.1016/j.im.2019.05.003>
- Berniell, L. (2021). Occupational choice and investments in human capital in informal Economies. *The B.E. Journal of Macroeconomics*, 21(2), 399-423. <https://doi.org/10.1515/bejm-2020-0024>
- Bhattacharya, R. (2019). ICT solutions for the informal sector in developing economies: What can one expect? *The Electronic Journal of Information Systems in Developing Countries*, 85(3), e12075. <https://doi.org/10.1002/isd2.12075>
- Bika, Z., Subalova, M., & Locke, C. (2022). Microfinance and small business development in a transitional economy: Insights from borrowers' relations with microfinance organisations in Kazakhstan. *The Journal of Development Studies*, 58(1), 183-203. <https://doi.org/10.1080/00220388.2021.1956472>
- Blunch, N.-H., & Raju, D. (2001). *The informal sector revisited: A synthesis across space and time*. World Bank.
- Boitan, I. A., & Ștefoni, S. E. (2023). Digitalization and the Shadow Economy: Impact Assessment and Policy Implications for EU Countries. *Eastern European Economics*, 61(2), 152-180. <https://doi.org/10.1080/00128775.2022.2102508>
- Bolboacă, M. B., Ruesga Benito, S. M., Agafitei, M. D., Davidescu, A. A., & Gheorghe, M. (2026). Integrating informality, skills, regional performance, and economic resilience: A comprehensive literature review and policy implications. *Management & Marketing*. <https://doi.org/10.1007/s44491-026-00004-x>
- Bravo-Ortega, C., Bustamante, C., Egana del Sol, P., Symmes, F., & Sexton, J. (2024). The formalization of microenterprises in middle-income countries: Informal institutions as a mechanism to address institutional incongruence. *Management Research: The Journal of the Iberoamerican Academy of Management*, 22(2), 178-212. <https://doi.org/10.1108/MRJIAM-04-2023-1417>
- Bruhn, M., & McKenzie, D. (2014). Entry regulation and the formalization of microenterprises in developing countries. *The World Bank Research Observer*, 29(2), 186-201.
- Chen, J. Y., & Qiu, J. L. (2019). Digital utility: Datafication, regulation, labor, and DiDi's platformization of urban transport in China. *Chinese Journal of Communication*, 12(3), 274-289. <https://doi.org/10.1080/17544750.2019.1614964>

- Chen, M.A., (2012). *The informal economy: Definitions, theories and policies*. WIEGO Working Paper N° 1. Women in Informal Employment: Globalizing and Organizing.
- Cho, Y., & Honorati, M. (2014). Entrepreneurship programs in developing countries: A meta regression analysis. *Labour Economics*, 28(1), 110-130. <https://doi.org/10.1016/j.labeco.2014.03.011>
- Choung, Y., Chatterjee, S., & Pak, T.-Y. (2023). Digital financial literacy and financial well-being. *Finance Research Letters*, 58, 104438. <https://doi.org/10.1016/j.frl.2023.104438>
- Cieslik, K., Banya, R., & Vira, B. (2022). Offline contexts of online jobs: Platform drivers, decent work, and informality in Lagos, Nigeria. *Development Policy Review*, 40(4), e12595. <https://doi.org/10.1111/dpr.12595>
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94, S95-S120.
- Daramola, O., & Etim, E. (2022). Affordances of digital platforms in Sub-Saharan Africa: An analytical review. *The Electronic Journal of Information Systems in Developing Countries*, 88(4), e12213. <https://doi.org/10.1002/isd2.12213>
- Darbi, W. P. K., Hall, C. M., & Knott, P. (2018). The informal sector: A review and agenda for management research. *International Journal of Management Reviews*, 20(2), 301-324. <https://doi.org/10.1111/ijmr.12131>
- Dau, L. A., & Cuervo-Cazurra, A. (2014). To formalize or not to formalize: Entrepreneurship and pro-market institutions. *Journal of Business Venturing*, 29(5), 668-686. <https://doi.org/10.1016/j.jbusvent.2014.05.002>
- Davidsson, P., & Honig, B. (2003). The role of social and human capital among nascent entrepreneurs. *Journal of Business Venturing*, 18(3), 301-331. [https://doi.org/10.1016/S0883-9026\(02\)00097-6](https://doi.org/10.1016/S0883-9026(02)00097-6)
- De Castro, J. O., Khavul, S., & Bruton, G. D. (2014). Shades of Grey: How do informal firms navigate between macro and meso institutional environments? *Strategic Entrepreneurship Journal*, 8(1), 75-94. <https://doi.org/10.1002/sej.1172>
- De Soto, H. (1989). *The Other Path: The Invisible Revolution in the Third World*. Harper & Row.
- Dedehouanou, S. F. A., & Araar, A. (2020). Gender, entrepreneurship and food security in Niger. *Review of Development Economics*, 24(3), 815-830. <https://doi.org/10.1111/rode.12657>
- Demenet, A., Razafindrakoto, M., & Roubaud, F. (2016). do informal businesses gain from registration and how? Panel data evidence from vietnam. *World Development*, 84, 326-341. <https://doi.org/10.1016/j.worlddev.2015.09.002>
- Donner, J. (2007). Customer acquisition among small and informal businesses in urban India: Comparing face-to-face and mediated channels. *The Electronic Journal of Information Systems in Developing Countries*, 32(1), 1-16. <https://doi.org/10.1002/j.1681-4835.2007.tb00222.x>
- Dumenu, W. K., Appiah, L. G., Paul, C., & Darr, D. (2023). Should forest enterprises formalize? Insight from a multi-dimensional characterization of informal baobab enterprises. *Forest Policy and Economics*, 150, 102935. <https://doi.org/10.1016/j.forpol.2023.102935>
- Ebrahim, A. Q., & Van Den Berg, C. L. (2024). The barriers to technology adoption among businesses in the informal economy in Cape Town. *South African Journal of Information Management*, 26(1), 1872. <https://doi.org/10.4102/sajim.v26i1.1872>
- Eckhardt, J. T., & Shane, S. A. (2003). Opportunities and entrepreneurship. *Journal of Management*, 29(3), 333-349. <https://doi.org/10.1177/014920630302900304>
- Elfring, T., & Hulsink, W. (2007). Networking by entrepreneurs: Patterns of tie—formation in emerging organizations. *Organization Studies*, 28(12), 1849-1872. <https://doi.org/10.1177/0170840607078719>
- Engström, P., & McKelvie, A. (2017). Financial literacy, role models, and micro-enterprise performance in the informal economy. *International Small Business Journal*, 35(7), 855-875. <https://doi.org/10.1177/0266242617717159>
- Estrin, S., Guerrero, M., & Mickiewicz, T. (2024). A framework for investigating new firm entry: The (limited) overlap between informal-formal and necessity-opportunity entrepreneurship. *Journal of Business Venturing*, 39(4), 106404. <https://doi.org/10.1016/j.jbusvent.2024.106404>
- Fajnzylber, P. R., Maloney, W. F., & Montes Rojas, G. V. (2009). Does formality improve micro-firm performance? Quasi-experimental evidence from the Brazilian simples program. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1501967>
- Foster, C. (2014). Does quality matter for innovations in low income markets? The case of the Kenyan mobile phone sector. *Technology in Society*, 38, 119-129. <https://doi.org/10.1016/j.techsoc.2014.03.003>
- Galdino, K. M., Molina-Sieiro, G., Lamont, B. T., & Holmes, R. M. (2023). Factor markets, institutional quality and firm formalisation: The contingent effect of economic conditions at the founding stage. *International Small Business Journal: Researching Entrepreneurship*, 41(4), 432-461. <https://doi.org/10.1177/02662426221101021>
- Ghore, Y., Long, B., Ozkok, Z., & Derici, D. (2023). Rethinking human capital: Perspectives from women working in the informal economy. *Development Policy Review*, 41(5), e12705. <https://doi.org/10.1111/dpr.12705>

- Godfrey, P. C. (2011). Toward a theory of the informal economy. *Academy of Management Annals*, 5(1), 231-277. <https://doi.org/10.5465/19416520.2011.585818>
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, 91(3), 481-510. <https://www.jstor.org/stable/2780199>
- Grant, R., & Oteng-Ababio, M. (2021). Formalising E-waste in Ghana: An emerging landscape of fragmentation and enduring barriers. *Development Southern Africa*, 38(1), 73-86. <https://doi.org/10.1080/0376835X.2020.1823822>
- Günther, I., & Launov, A. (2012). Informal employment in developing countries. *Journal of Development Economics*, 97(1), 88-98. <https://doi.org/10.1016/j.jdeveco.2011.01.001>
- Hair, J. F., Ringle, C. M., Gudergan, S. P., Fischer, A., Nitzl, C., & Meenckes, C. (2019). Partial least squares structural equation modeling-based discrete choice modeling: An illustration in modeling retailer choice. *Business Research*, 12(1), 115-142. <https://doi.org/10.1007/s40685-018-0072-4>
- Halabí, T., & Mora-Esquivel, R. (2017). Tamaño de la muestra en modelos de ecuaciones estructurales con constructos latentes: Un método práctico. *Actualidades Investigativas en Educación*, 17(1). <https://doi.org/10.15517/aie.v17i1.27294>
- Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management & Data Systems*, 116(1), 2-20. <https://doi.org/10.1108/IMDS-09-2015-0382>
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115-135. <https://doi.org/10.1007/s11747-014-0403-8>
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *New Challenges to International Marketing*, 20, 277-319. [https://doi.org/10.1108/S1474-7979\(2009\)0000020014](https://doi.org/10.1108/S1474-7979(2009)0000020014)
- Heredia, J., Castillo-Vergara, M., Geldes, C., Gamarra, F. M. C., Flores, A., & Heredia, W. (2022). How do digital capabilities affect firm performance? The mediating role of technological capabilities in the "new normal". *Journal of Innovation & Knowledge*, 7(2), 100171. <https://doi.org/10.1016/j.jik.2022.100171>
- Huang, H.-C. (2016). Entrepreneurial resources and speed of entrepreneurial success in an emerging market: The moderating effect of entrepreneurship. *International Entrepreneurship and Management Journal*, 12(1), 1-26. <https://doi.org/10.1007/s11365-014-0321-8>
- Huang, H.-C., Lai, M.-C., & Lo, K.-W. (2012). Do founders' own resources matter? The influence of business networks on start-up innovation and performance. *Technovation*, 32(5), 316-327. <https://doi.org/10.1016/j.technovation.2011.12.004>
- Ibidunni, A. S., Kolawole, A. I., Olokundun, M. A., & Ogbari, M. E. (2020). Knowledge transfer and innovation performance of small and medium enterprises (SMEs): An informal economy analysis. *Heliyon*, 6(8), e04740. <https://doi.org/10.1016/j.heliyon.2020.e04740>
- Igudia, E., Ackrill, R., & Machokoto, M. (2022). Institutional incongruence, the everyday, and the persistence of street vending in Lagos: A demand-side perspective. *Environment and Planning A: Economy and Space*, 54(6), 1256-1276. <https://doi.org/10.1177/0308518X221083989>
- Irwin, K., McDowell, W., & Ribeiro-Navarrete, S. (2025). How can women entrepreneurs overcome funding challenges: The role of digitalization and innovation. *Venture Capital*, 27(2), 225-247. <https://doi.org/10.1080/13691066.2023.2282542>
- Jiménez, A., Palmero-Cámara, C., González-Santos, M. J., González-Bernal, J., & Jiménez-Eguizábal, J. A. (2015). The impact of educational levels on formal and informal entrepreneurship. *BRQ Business Research Quarterly*, 18(3), 204-212. <https://doi.org/10.1016/j.brq.2015.02.002>
- Jimenez, A., Puche-Regaliza, J. C., Jiménez-Eguizábal, J. A., & Alon, I. (2017). Political discretion and corruption: The impact of institutional quality on formal and informal entrepreneurship. *European Journal of International Management*, 11(3), 280-300. <https://doi.org/10.1504/EJIM.2017.083873>
- Keskinen, P., Winschiers-Theophilus, H., Chivuno-Kuria, S., Müller, A., & Nieminen, M. (2022). Digital microwork as a livelihood strategy in a Namibian informal settlement. *The Electronic Journal of Information Systems in Developing Countries*, 88(1), e12197. <https://doi.org/10.1002/isd2.12197>
- Khavul, S., Chavez, H., & Bruton, G. D. (2013). When institutional change outruns the change agent: The contested terrain of entrepreneurial microfinance for those in poverty. *Journal of Business Venturing*, 28(1), 30-50. <https://doi.org/10.1016/j.jbusvent.2012.02.005>
- Kim, K. (2022). Assessing the impact of mobile money on improving the financial inclusion of Nairobi women. *Journal of Gender Studies*, 31(3), 306-322. <https://doi.org/10.1080/09589236.2021.1884536>
- Kirchherr, J., & Charles, K. (2018). Enhancing the sample diversity of snowball samples: Recommendations from a research project on anti-dam movements in Southeast Asia. *PLOS ONE*, 13(8), e0201710. <https://doi.org/10.1371/journal.pone.0201710>
- Kline, R. B. (2023). *Principles and practice of structural equation modeling*. Guilford publications.

- Kloosterman, R., Van Der Leun, J., & Rath, J. (1999). Mixed embeddedness: (in)formal economic activities and immigrant businesses in the Netherlands. *International Journal of Urban and Regional Research*, 23(2), 252-266. <https://doi.org/10.1111/1468-2427.00194>
- Kock, N. (2017). Common Method Bias: A Full Collinearity Assessment Method for PLS-SEM. In H. Latan & R. Noonan (Eds.), *Partial Least Squares Path Modeling: Basic Concepts, Methodological Issues and Applications* (pp. 245-257). Springer International Publishing. https://doi.org/10.1007/978-3-319-64069-3_11
- Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, 15(5), 411-432. [https://doi.org/10.1016/S0883-9026\(98\)00033-0](https://doi.org/10.1016/S0883-9026(98)00033-0)
- Kumar, P., Pillai, R., Kumar, N., & Tabash, M. I. (2023). The interplay of skills, digital financial literacy, capability, and autonomy in financial decision making and well-being. *Borsa Istanbul Review*, 23(1), 169-183. <https://doi.org/10.1016/j.bir.2022.09.012>
- La Porta, R., & Shleifer, A. (2008). The unofficial economy and economic development. *Brookings Papers on Economic Activity*, 2008, 275-352. <https://doi.org/10.2139/ssrn.1304760>
- La Porta, R., & Shleifer, A. (2014). Informality and development. *Journal of Economic Perspectives*, 28(3), 109-126. <https://doi.org/10.1257/jep.28.3.109>
- Langevang, T., Gough, K. V., Yankson, P. W. K., Owusu, G., & Osei, R. (2015). Bounded entrepreneurial vitality: The mixed embeddedness of female entrepreneurship. *Economic Geography*, 91(4), 449-473. <https://doi.org/10.1111/ecge.12092>
- Lee, D. Y., & Tsang, E. W. K. (2001). The effects of entrepreneurial personality, background and network activities on venture growth. *Journal of Management Studies*, 38(4), 583-602. <https://doi.org/10.1111/1467-6486.00250>
- Liñán, F., & Chen, Y. (2009). Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrepreneurship Theory and Practice*, 33(3), 593-617. <https://doi.org/10.1111/j.1540-6520.2009.00318.x>
- Liu, Y., Schött, T., & Zhang, C. (2019). Women's experiences of legitimacy, satisfaction and commitment as entrepreneurs: Embedded in gender hierarchy and networks in private and business spheres. *Entrepreneurship & Regional Development*, 31(3-4), 293-307. <https://doi.org/10.1080/08985626.2018.1551794>
- Loayza, N. V. (2016). Informality in the process of development and growth. *The World Economy*, 39(12), 1856-1916. <https://doi.org/10.1111/twec.12480>
- Makate, C., Makate, M., Siziba, S., & Sadomba, Z. (2019). The impact of innovation on the performance of small-to-medium informal metal-trade enterprises in Zimbabwe. *Cogent Business & Management*, 6(1), 1625095. <https://doi.org/10.1080/23311975.2019.1625095>
- Maloney, W. F. (2004). Informality revisited. *World Development*, 32(7), 1159-1178. <https://doi.org/10.1016/j.worlddev.2004.01.008>
- Meagher, K. (2015). Leaving no one behind?: Informal economies, economic inclusion and islamic extremism in Nigeria. *Journal of International Development*, 27(6), 835-855. <https://doi.org/10.1002/jid.3117>
- Meagher, K. (2021). Informality and the infrastructures of inclusion: An introduction. *Development and Change*, 52(4), 729-755. <https://doi.org/10.1111/dech.12672>
- Misganaw, B. A., Assefa, D. Z., & Colovic, A. (2023). Is starting and staying unregistered longer beneficial for firms? The moderating role of institutional quality. *International Journal of Entrepreneurial Behavior & Research*, 29(2), 433-458. <https://doi.org/10.1108/IJE-BR-07-2022-0582>
- Mukorera, S. Z. E. (2019). Willingness to formalize: a case study of the informal micro and small-scale enterprises in Zimbabwe. *Journal of Developmental Entrepreneurship*, 24(1), 1950001. <https://doi.org/10.1142/S1084946719500018>
- Müller, J. (2017). Place-based (in)formalization: a Bolivian marketplace for consumer electronics and global brands. *Latin American Research Review*, 52(3), 393-404. <https://doi.org/10.25222/larr.68>
- Nason, R., Vedula, S., Bothello, J., Bacq, S., & Charman, A. (2024). Sight unseen: The visibility paradox of entrepreneurship in an informal economy. *Journal of Business Venturing*, 39(2), 106364. <https://doi.org/10.1016/j.jbusvent.2023.106364>
- Nguimkeu, P. (2022). A structural model of informality with constrained entrepreneurship. *Economic Development and Cultural Change*, 70(3), 941-980. <https://doi.org/10.1086/713934>
- Nguimkeu, P., & Okou, C. (2021). Leveraging digital technologies to boost productivity in the informal sector in Sub-Saharan Africa. *Review of Policy Research*, 38(6), 707-731. <https://doi.org/10.1111/ropr.12441>
- Nguyen, T., Verreynne, M.-L., & Steen, J. (2014). Drivers of firm formalization in Vietnam: An attention theory explanation. *Entrepreneurship & Regional Development*, 26(7-8), 574-593. <https://doi.org/10.1080/08985626.2014.959069>
- Orrensalo, T., Brush, C., & Nikou, S. (2024). Entrepreneurs' information-seeking behaviors in the digital age—A systematic literature review. *Journal of Small Business Management*, 62(2), 892-937. <https://doi.org/10.1080/00472778.2022.2100896>
- Oteng, S. A., Manful, E., & Nkansah, J. O. (2024). Digital literacy in the informal economy of Ghana: Life-long learning and extending working lives of older persons in post-covid-19 era. *Journal of Cross-Cultural Gerontology*, 39(4), 375-395. <https://doi.org/10.1007/s10823-024-09514-9>

- Oteng-Ababio, M., Owusu, G., & Chama, M. (2016). Intelligent enterprise: Wasting, valuing and re-valuing waste electrical and electronic equipment. *The Geographical Journal*, 182(3), 265-275. <https://doi.org/10.1111/geoj.12140>
- Palacios Duarte, P. D., Gutiérrez Ponce, H., & Saavedra García, M. L. (2022). Análisis de los factores determinantes de microempresarios informales, 2016-2020. *Revista de Economía Mundial*, (60), 101-123. <https://doi.org/10.33776/rem.v0i60.5608>
- Pasquier-Doumer, L. (2013). Intergenerational transmission of self-employed status in the informal sector: A constrained choice or better income prospects? Evidence from seven west African countries. *Journal of African Economies*, 22(1), 73-111. <https://doi.org/10.1093/jae/ejs017>
- Pels, J., Araujo, L., & Kidd, T. A. (2022). Informal sellers and formal markets: A habitus gap. *Journal of Business & Industrial Marketing*, 37(6), 1269-1280. <https://doi.org/10.1108/JBIM-03-2021-0180>
- Peng, T. (2023). Importance of “the social”: The divergent informal careers of Chinese internal migrants. *Critical Sociology*, 49(1), 133-145. <https://doi.org/10.1177/08969205211051784>
- Perry, G. (2007). *Informality: Exit and exclusion*. World Bank Latin American and Caribbean Studies. World Bank Publications. <https://doi.org/10.1596/978-0-8213-7092-6>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Popescu, G., Davidescu, A., & Huidumac, C. (2018). Researching the Main Causes of the Romanian Shadow Economy at the Micro and Macro Levels: Implications for Sustainable Development. *Sustainability*, 10(10), 3518. <https://doi.org/10.3390/su10103518>
- Portes, A., Castells, M., & Benton, L. A. (1989). *The informal economy: Studies in advanced and less developed countries*. Johns Hopkins University Press.
- Queralt, J. (2019). Protecting the entrepreneurial poor: A human rights approach. *Politics, Philosophy & Economics*, 18(4), 336-357. <https://doi.org/10.1177/1470594X19860235>
- Ramirez, H., & Hondagneu-Sotelo, P. (2009). Mexican immigrant gardeners: Entrepreneurs or exploited workers? *Social problems*, 56(1), 70-88. <https://doi.org/10.1525/sp.2009.56.1.70>
- Rangaswamy, N. (2019). A note on informal economy and ICT. *The Electronic Journal of Information Systems in Developing Countries*, 85(3), e12083. <https://doi.org/10.1002/isd2.12083>
- Rivera Huerta, R. (2017). Heterogeneidad en las microempresas informales mexicanas: Evidencia empírica y algunas implicaciones de política. *Perfiles Latinoamericanos*, 26(51), 63-87. <https://doi.org/10.18504/pl2651-003-2018>
- Saleh, Y. (2021). ICT, social media and COVID-19: Evidence from informal home-based business community in Kuwait City. *Journal of Enterprising Communities: People and Places in the Global Economy*, 15(3), 395-413. <https://doi.org/10.1108/JEC-07-2020-0131>
- Salvi, E., Belz, F., & Bacq, S. (2023). Informal Entrepreneurship: An integrative review and future research agenda. *Entrepreneurship Theory and Practice*, 47(2), 265-303. <https://doi.org/10.1177/10422587221115365>
- Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Treating unobserved heterogeneity in PLS-SEM: A multi-method approach. In *partial least squares path modeling*. Springer. https://doi.org/10.1007/978-3-319-64069-3_9
- Schneider, F., & Enste, D. H. (2000). Shadow economies: Size, causes, and consequences. *Journal of Economic Literature*, 38(1), 77-114. <https://doi.org/10.1257/jel.38.1.77>
- Schneider, F., Morkunas, M., & Quendler, E. (2023). An estimation of the informal economy in the agricultural sector in the EU-15 from 1996 to 2019. *Agribusiness*, 39(2), 406-447. <https://doi.org/10.1002/agr.21774>
- Schneider, F., & Williams, C. C. (2013). *The shadow economy*. IEA, Inst. of Economic Affairs.
- Scott, W. R. (2013). *Institutions and Organizations: Ideas, Interests, and Identities*. SAGE Publications.
- Senyo, P. K., Gozman, D., Karanasios, S., Dacre, N., & Baba, M. (2023). Moving away from trading on the margins: Economic empowerment of informal businesses through FINTECH. *Information Systems Journal*, 33(1), 154-184. <https://doi.org/10.1111/isj.12403>
- Sepulveda, L., Syrett, S., & Lyon, F. (2011). Population superdiversity and new migrant enterprise: The case of London. *Entrepreneurship & Regional Development*, 23(7-8), 469-497. <https://doi.org/10.1080/08985620903420211>
- Shabbir, M. S., & Salman, R. (2026). Entrepreneurship at the edge of informality and digitalization: Mapping hybrid business models in underinstitutionalized contexts. *Journal of Small Business Management*, 1-39. <https://doi.org/10.1080/00472778.2025.2606049>
- Shahid, M. S., Rodgers, P., Vershinina, N., Zehra, M. E., & Williams, C. C. (2022). Advancing the institutional perspective on informal entrepreneurship: A study of formalization intentions among street entrepreneurs. *International Journal of Entrepreneurial Behavior & Research*, 28(8), 2103-2131. <https://doi.org/10.1108/IJE-BR-02-2022-0151>
- Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J.-H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict. *European Journal of Marketing*, 53(11), 2322-2347. <https://doi.org/10.1108/EJM-02-2019-0189>

- Silupu, B., Usero, B., & Montoro-Sánchez, Á. (2022). The transition toward the business formality of the Peruvian MSEs: How does the perception of entrepreneurs and the sector influence? *Academia Revista Latinoamericana de Administración*, 35(1), 100-114. <https://doi.org/10.1108/ARLA-05-2021-0106>
- Siqueira, A. C. O., Webb, J., & Bruton, G. D. (2016). Informal entrepreneurship and industry conditions. *Entrepreneurship Theory and Practice*, 40(1), 177-200. <https://doi.org/10.1111/etap.12115>
- Sousa, V. D., & Rojjanasrirat, W. (2011). Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: A clear and user-friendly guideline. *Journal of Evaluation in Clinical Practice*, 17(2), 268-274. <https://doi.org/10.1111/j.1365-2753.2010.01434.x>
- Streukens, S., & Leroi-Werelds, S. (2016). Bootstrapping and PLS-SEM: A step-by-step guide to get more out of your bootstrap results. *European Management Journal*, 34(6), 618-632. <https://doi.org/10.1016/j.emj.2016.06.003>
- Subramaniam, M., & Youndt, M. A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal*, 48(3), 450-463. <https://doi.org/10.5465/AMJ.2005.17407911>
- Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *The Academy of Management Review*, 20(3), 571. <https://doi.org/10.2307/258788>
- Sutter, C., Webb, J., Kistruck, G., Ketchen, D. J., & Ireland, R. D. (2017). Transitioning entrepreneurs from informal to formal markets. *Journal of Business Venturing*, 32(4), 420-442. <https://doi.org/10.1016/j.jbusvent.2017.03.002>
- Thai, M. T. T., & Turkina, E. (2014). Macro-level determinants of formal entrepreneurship versus informal entrepreneurship. *Journal of Business Venturing*, 29(4), 490-510. <https://doi.org/10.1016/j.jbusvent.2013.07.005>
- Uyar, A., Nimer, K., Kuzey, C., Shahbaz, M., & Schneider, F. (2021). Can e-government initiatives alleviate tax evasion? The moderation effect of ICT. *Technological Forecasting and Social Change*, 166, 120597. <https://doi.org/10.1016/j.techfore.2021.120597>
- Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889-901. <https://doi.org/10.1016/j.jbusres.2019.09.022>
- Viswanathan, M., Echambadi, R., Venugopal, S., & Sridharan, S. (2014). Subsistence entrepreneurship, value creation, and community exchange systems: a social capital explanation. *Journal of Macromarketing*, 34(2), 213-226. <https://doi.org/10.1177/0276146714521635>
- Wang, X., Wang, Z., Wang, Q., Chen, W., & Pi, Z. (2021). Supporting digitally enhanced learning through measurement in higher education: Development and validation of a university students' digital competence scale. *Journal of Computer Assisted Learning*, 37(4), 1063-1076. <https://doi.org/10.1111/jcal.12546>
- Webb, J., Bruton, G. D., Tihanyi, L., & Ireland, R. D. (2013). Research on entrepreneurship in the informal economy: Framing a research agenda. *Journal of Business Venturing*, 28(5), 598-614. <https://doi.org/10.1016/j.jbusvent.2012.05.003>
- Webb, J., Ireland, R. D., & Ketchen, D. J. (2014). Toward a greater understanding of entrepreneurship and strategy in the informal economy. *Strategic Entrepreneurship Journal*, 8(1), 1-15. <https://doi.org/10.1002/sej.1176>
- Webb, J., Khoury, T., & Hitt, M. (2020). The Influence of Formal and Informal Institutional Voids on Entrepreneurship. *Entrepreneurship Theory and Practice*, 44(3), 504-526. <https://doi.org/10.1177/1042258719830310>
- Webb, J., Tihanyi, L., Ireland, R. D., & Sirmon, D. G. (2009). You say illegal, i say legitimate: Entrepreneurship in the Informal Economy. *Academy of Management Review*, 34(3), 492-510. <https://doi.org/10.5465/amr.2009.40632826>
- Weber, C. E., Okraku, M., Mair, J., & Maurer, I. (2021). Steering the transition from informal to formal service provision: Labor platforms in emerging-market countries. *Socio-Economic Review*, 19(4), 1315-1344. <https://doi.org/10.1093/ser/mwab008>
- Wei, S., Su, Z., Ahlstrom, D., & Wu, Z. (2023). State fragility and informal entrepreneurship: The moderating effects of human capital under varying temporal orientations. *Journal of International Management*, 29(1), 100992. <https://doi.org/10.1016/j.intman.2022.100992>
- Westland, J. C. (2015). *Structural equation models: From paths to networks*. Springer. <https://doi.org/10.1007/978-3-319-16507-3>
- Williams, C. C. (2007). Tackling undeclared work in Europe: lessons from a study of Ukraine. *European Journal of Industrial Relations*, 13(2), 219-236. <https://doi.org/10.1177/0959680107078254>
- Williams, C. C., & Baric, M. (2014). Special issue: Entrepreneurship in the informal sector: Institutional perspectives. *Journal of Small Business & Entrepreneurship*, 27(1), 116-117. <https://doi.org/10.1080/08276331.2014.963375>
- Williams, C. C., & Kedir, A. M. (2017). Starting-up unregistered and firm performance in Turkey. *International Entrepreneurship and Management Journal*, 13(3), 797-817. <https://doi.org/10.1007/s11365-016-0425-4>
- Williams, C. C., & Kedir, A. M. (2019). Explaining cross-country variations in the prevalence of informal sector competitors: Lessons from the World Bank Enterprise Survey. *International Entrepreneurship and Management Journal*, 15(3), 677-696. <https://doi.org/10.1007/s11365-018-0527-2>

- Williams, C. C., Martinez-Perez, A., & Kadir, A. M. (2017). Informal entrepreneurship in developing economies: The impacts of starting up unregistered on firm performance. *Entrepreneurship Theory and Practice*, 41(5), 773-799. <https://doi.org/10.1111/etap.12238>
- Williams, C. C., & Shahid, M. S. (2016). Informal entrepreneurship and institutional theory: Explaining the varying degrees of (in)formalization of entrepreneurs in Pakistan. *Entrepreneurship & Regional Development*, 28(1-2), 1-25. <https://doi.org/10.1080/08985626.2014.963889>
- Xheneti, M., Madden, A., & Thapa Karki, S. (2019). Value of formalization for women entrepreneurs in developing contexts: A review and research agenda. *International Journal of Management Reviews*, 21(1), 3-23. <https://doi.org/10.1111/ijmr.12172>
- Yáñez-Valdés, C., Barros-Celume, S., & Tautiva, J. A. D. (2026). Unpacking the relationship between digitalization and formalization among micro-entrepreneurs in an emerging market. *Technology in Society*, 103250. <https://doi.org/10.1016/j.techsoc.2026.103250>
- Zapata Campos, M. J., Kain, J. H., Oloko, M., Scheinsohn, M., Stenberg, J., & Zapata, P. (2022). Residents' collective strategies of resistance in Global South cities' informal settlements: Space, scale and knowledge. *Cities*, 125, 103663. <https://doi.org/10.1016/j.cities.2022.103663>
- Zhu, H., Chen, Y., & Chen, K. (2019). Vitalizing rural communities: China's rural entrepreneurial activities from perspective of mixed embeddedness. *Sustainability*, 11(6), 1609. <https://doi.org/10.3390/su11061609>

