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Institutions and macroeconomic indicators: entrepreneurial activities across the world

Oğuz Kara
Department of Health Management, Düzce University, Duzce, Turkey
Levent Altinay
Faculty of Business, Oxford Brookes University, Oxford, UK
Mehmet Bağış
Department of International Trade and Finance, Sakarya University of Applied Sciences, Sakarya, Turkey
Mehmet Nurullah Kurutkan
Department of Health Management, Düzce University, Duzce, Turkey, and
Sanaz Vatankhah
School of Aviation, Marketing and Tourism, University of Bedfordshire Business School, Luton, UK

Abstract

Purpose – Entrepreneurial activity is a phenomenon that increases the economic growth of countries and improves their social welfare. The economic development levels of countries have significant effects on these entrepreneurial activities. This research examines which institutional and macroeconomic variables explain early-stage entrepreneurship activities in developed and developing economies.

Design/methodology/approach – The authors conducted panel data analysis on the data from the Global Entrepreneurship Monitor (GEM) and International Monetary Fund (IMF) surveys covering the years 2009–2018.

Findings – First, the authors' results reveal that cognitive, normative and regulatory institutions and macroeconomic factors affect early-stage entrepreneurial activity in developed and developing countries differently. Second, the authors' findings indicate that cognitive, normative and regulatory institutions affect early-stage entrepreneurship more positively in developed than developing countries. Finally, the authors' results report that macroeconomic factors are more effective in early-stage entrepreneurial activity in developing countries than in developed countries.

Originality/value – This study provides a better understanding of the components that help explain the differences in entrepreneurship between developed and developing countries regarding institutions and macroeconomic factors. In this way, it contributes to developing entrepreneurship literature with the theoretical achievements of combining institutional theory and macroeconomic indicators with entrepreneurship literature.

Keywords Institutions, Macroeconomic indicators, Entrepreneurial activity, Comparison of developed and developing countries, Panel data analysis

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1. Introduction

The rapid changes in the global economy significantly impact both developed and developing economies. Entrepreneurial activities are one of the principal driving forces behind this

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accelerated pace of change. Moreover, there is broad scholarly consensus that institutions (Wales *et al.*, 2021; Pindado *et al.*, 2023; Medase *et al.*, 2023), macroeconomic indicators (Charfeddine and Zaouali, 2022) and the developmental stages of countries (De Mello *et al.*, 2022) act as guiding forces for entrepreneurial activities. Recent studies have emphasized the role of institutions (Bjørnskov and Foss, 2016; Li *et al.*, 2021; De Mello *et al.*, 2022) and macroeconomic indicators (Charfeddine and Zaouali, 2022) in shaping entrepreneurial activities in both developed and developing economies (Afawubo and Noglo, 2022; De Mello *et al.*, 2022; Stephen *et al.*, 2005; Escandon-Barbosa *et al.*, 2019; Guerrero *et al.*, 2021). Despite these insights, our understanding of the multilevel impacts of institutions and macroeconomic indicators on entrepreneurial activities remains incomplete.

Most studies within the entrepreneurship literature have proven to be insufficient in producing results that concurrently evaluate institutions and macroeconomic indicators (Charfeddine and Zaouali, 2022). Recent research focusing on institutions has sought to elucidate their effects on entrepreneurship while also considering the economic development statuses of countries, thereby attempting to address existing gaps in our understanding of these dynamics (De Mello *et al.*, 2022; Junior *et al.*, 2020; Chowdhury *et al.*, 2019; Amorós *et al.*, 2019a; Aparicio *et al.*, 2016; Carlos *et al.*, 2013). Nonetheless, the extant literature reveals positive yet nuanced and inconclusive findings concerning the correlation between institutions and entrepreneurship, which underscores the need for further research (Stenholm *et al.*, 2013; Valdez and Richardson, 2013; Audretsch *et al.*, 2022a). For instance, Stenholm *et al.* (2013) integrated data from diverse sources to explore how variations in institutional arrangements affect the rate and nature of entrepreneurial activity within countries; however, their analysis was constrained to a limited timeframe (2007–2009). Similarly, Bogatyreva *et al.* (2022) assessed the relationship between institutions and entrepreneurship for 2013–2015 within a limited temporal scope. In focusing on the role of institutions in latent and emergent entrepreneurship, Audretsch *et al.* (2022a) confined their analysis to specific variables such as corruption in informal institutions and property rights and state size in formal institutions. These studies' limitations in terms of time and variables prompt us to scrutinize this relationship over a more extended timeframe and with a broader set of variables. This endeavor is further supported by recent calls for research and existing studies that advocate institutional explanations for variations in entrepreneurial activity between developed and developing economies (Cao and Shi, 2021; De Mello *et al.*, 2022; Li *et al.*, 2021; Sethuram *et al.*, 2021; Bağış *et al.*, 2023a).

Research evaluating the impact of macroeconomic indicators on entrepreneurial activities in conjunction with institutions is limited and has yielded contradictory results (Guerrero *et al.*, 2021). Charfeddine and Zaouali (2022), in a study examining the effects of economic growth, inflation rates and unemployment on entrepreneurial activity, found that their impact on early-stage and incumbent firms varied in significance and direction. Radosevic and Yoruk (2013) concluded that gross domestic product (GDP) positively affects domestic demand while negatively influencing entrepreneurial activity (Carree *et al.*, 2007; Uhlaner and Thurik, 2010). Other research suggests that unemployment rate fluctuations can positively (Charfeddine and Zaouali, 2022) and negatively (Hameed *et al.*, 2022) impact entrepreneurial activity. These studies make significant contributions to the existing body of knowledge by shedding light on the influence of macroeconomic indicators on entrepreneurial activities. However, they largely overlook the impact of key macroeconomic indicators such as gross debt stock, total exports and imports on entrepreneurial activities. Investigating these factors is pivotal, as a country's gross debt stock can either facilitate or impede early-stage entrepreneurs' access to financial resources (Agyapong and Bedjapeng, 2020). Specifically, total exports can bolster a country's export-driven economic growth and stimulate new entrepreneurial initiatives (Donbesuur *et al.*, 2023; Mansion and Bausch, 2020). Conversely, total imports can support and potentially hinder entrepreneurial activities by fostering an

import-dependent economic model that dampens entrepreneurial spirit (Zhakupov *et al.*, 2023). Additionally, prior studies have identified factors such as the current account balance (Liargovas *et al.*, 2022), consumer price index, gross national savings, domestic investment expenditures (Ribaj and Mexhuani, 2021) and population (Millan *et al.*, 2014) as exerting influence on entrepreneurial activities.

Our study adopts a holistic approach to analyze the macroeconomic indicators previously mentioned and conducts longitudinal tests across multiple variables to evaluate their influence on entrepreneurial activities in both developed and developing countries. Specifically, our research examines the impact of institutions and macroeconomic indicators on Total Early-Stage Entrepreneurial Activity (TEA) in these countries. TEA represents the percentage of the population aged 18–64 who are either nascent entrepreneurs (actively setting up a business) or owner-managers of new enterprises (up to 3.5 years old) (Patrício and Ferreira, 2023; Khurana *et al.*, 2023; Graham and Bonner, 2022; Hessels *et al.*, 2011). We draw on data from the Global Entrepreneurship Monitor (GEM) to evaluate the effects of institutions on TEA and from the International Monetary Fund (IMF) to assess the impact of macroeconomic indicators (Bogatyreva *et al.*, 2022; Gao *et al.*, 2021; Wales *et al.*, 2021). Developed countries typically possess higher-quality institutions and more stable macroeconomic indicators than developing countries, which often operate within uncertain, ambiguous and volatile institutional and macroeconomic frameworks (Audretsch *et al.*, 2023a; De Mello *et al.*, 2022; Welter and Smallbone, 2011). Given the institutional and macroeconomic heterogeneity between developed and developing countries, these factors will likely influence potential and established entrepreneurs differently (Guerrero *et al.*, 2021). It has been established in developed countries that government programs (Heinonen and Hytti, 2016) and university spin-offs (Hannibal *et al.*, 2016) positively influence entrepreneurial activities. In contrast, developing countries often grapple with ineffective and inefficient regulations – such as tax and legal codes – as well as socio-cultural norms that create a challenging environment for entrepreneurs, particularly women (Guerrero *et al.*, 2021; Mair and Marti, 2007). Given this complex backdrop, the inconsistent findings regarding the impact of institutions and macroeconomic indicators on entrepreneurial activities in developed and developing economies constitute a research gap warranting further exploration.

The contributions of this research can be categorized under two main headings. First, the study elucidates disparities in entrepreneurial activities between developed and developing countries by comprehensively examining institutional variables. Unlike previous research that has generally focused on select elements of regulatory institutions (De Mello *et al.*, 2022; Stenholm *et al.*, 2013; Urbano and Alvarez, 2014), our study incorporates a more extensive set of variables. These include entrepreneurial finance, research and development transfers, internal market dynamics, entry regulations and physical infrastructure. Our investigation thus diverges substantively from extant literature in terms of the scope of cognitive-cultural, normative and regulatory institutional variables considered (Audretsch *et al.*, 2022a; Bogatyreva *et al.*, 2022; Charfeddine and Zaouali, 2022; De Mello *et al.*, 2022; Bosma *et al.*, 2018; Castaño *et al.*, 2015; Urbano and Alvarez, 2014; Stenholm *et al.*, 2013; Valdez and Richardson, 2013). This comprehensive approach enriches both the entrepreneurship and institutional theory fields by bridging them in a novel way (Díez-Martín *et al.*, 2022; Duran *et al.*, 2019; Eijdenberg *et al.*, 2019; Su *et al.*, 2017; Bruton *et al.*, 2010). Second, our study addresses the limitations of prior research by offering explanations for early-stage entrepreneurial activities in developed and developing countries through a diverse array of macroeconomic indicators. In this regard, we include macroeconomic variables previously overlooked in the literature, such as gross debt stock, total exports, total imports, current account balance, gross national savings and domestic investment expenditures (Fan *et al.*, 2023; Charfeddine and Zaouali, 2022; Junaid *et al.*, 2022; Ragmoun, 2023). In summary, our research is the first to

comprehensively analyze the effects of institutional and macroeconomic indicators on entrepreneurial activities in developed and developing countries.

The research is structured into four sections, excluding the introduction. The next section presents the literature review and hypothesis development. The research methodology is detailed in the third section, while the fourth section presents the findings. Finally, in the discussion section, we provide theoretical and practical implications, address research limitations and offer suggestions for future research.

2. Literature review and hypothesis development

2.1 Institutions and entrepreneurial activity

Institutions are humanly devised constraints that shape human interaction and establish the rules of the game in society (North, 1990). There are two classifications of institutions: formal, informal and semi-formal (North, 1990; Batjargal *et al.*, 2013) and regulatory, normative and cognitive (Scott, 1995). The first of these distinctions is based on new institutional economics (North, 1990), while the second is rooted in institutional theory (Scott, 1995). These research branches are also utilized in entrepreneurship research (Gölgeci *et al.*, 2017). However, considering the criticisms that past entrepreneurship research is predominantly grounded in economics and that the sociological basis is often neglected (Bjørnskov and Foss, 2016), this research will examine the effects of cognitive-cultural, normative and regulatory institutions (Scott, 1995) on entrepreneurial activities from a sociological perspective.

Institutions exhibit heterogeneous features due to societies' unique structures and interactions (North, 1990; Acemoglu and Robinson, 2012). They facilitate, limit and shape the preferences of individuals in society, including entrepreneurs in the business world (Aparicio *et al.*, 2021). The impact of institutions on individuals' social behavior suggests that they may also influence the entrepreneurial behavior of entrepreneurs (Scott, 1995; Busenitz *et al.*, 2000; Valdez and Richardson, 2013; Yay *et al.*, 2018). Therefore, we can presume that institutions have a significant influence on entrepreneurs' perception of opportunities and threats in the market, their decision to start a venture, their entrepreneurial preferences, their managerial practices and the success or failure of an enterprise (De Clercq *et al.*, 2010a; Valdez and Richardson, 2013; Stenholm *et al.*, 2013; Al Mamari *et al.*, 2022). However, institutional factors are associated with firm-level entrepreneurial activity within a specific national culture (Hofstede *et al.*, 2002; Wales *et al.*, 2021) and studies have found cross-country differences in corporate environmental components and entrepreneurial orientations, including risk-taking and proactive behavior dimensions (Kreiser *et al.*, 2002). In this context, based on institutional theory, we can consider cognitive, normative and regulatory institutions as the precursors of TEA and examine the effects of institutional dimensions on TEA.

2.1.1 Cognitive-cultural institutions. The cognitive-cultural dimension of institutions refers to how culture shapes individuals' interpretations, thoughts, perceptions and evaluations (Hofstede, 1980; Scott, 1995; Busenitz *et al.*, 2000; Bogatyreva *et al.*, 2022). This influence extends to entrepreneurs, impacting their cognitive structure and processes. Cognitive-cultural institutions are recognized as moderators in the relationship between contextual factors and entrepreneurial behaviors. This role highlights that national culture does not solely determine entrepreneurial activities but acts as a catalyst or guide for entrepreneurial behaviors. Research has shown that national cultural differences influence the motivation and performance of entrepreneurs (Hofstede *et al.*, 2002). Moreover, studies suggest that cognitive-cultural institutions affect the cognitive factors of entrepreneurs, including their risk-taking capacity, self-confidence, fear of failure (Tsai *et al.*, 2016), perceived opportunities (Stenholm *et al.*, 2013), perceived capabilities (De Mello *et al.*, 2022) and internal locus of control (Valdez and Richardson, 2013).

Based on these considerations, we can argue that cognitive-cultural institutions vary across countries, contributing to understanding the connection between entrepreneurial activities and national distinctions (Mitchell *et al.*, 2002). In this study, we propose that the influence of cognitive-cultural institutions on early-stage entrepreneurial activities differs depending on the level of economic development in a country. To present a comprehensive perspective on the impact of cognitive-cultural institutions on early entrepreneurship, we have identified variables commonly utilized in previous research. These variables encompass perceived opportunities, perceived capabilities, fear of failure, entrepreneurial intentions, entrepreneurial employee activity, entrepreneurship motivation and entrepreneurship education.

Perceived opportunities refer to the perception of individuals who believe there is an opportunity to start a business in their region (Bosma *et al.*, 2012a, b). Perceived opportunities lie at the heart of starting and growing a business (Stenholm *et al.*, 2013; Chowdhury *et al.*, 2019; Al Mamari *et al.*, 2022). These cognitive factors are considered precursors in investigating, perceiving and identifying opportunities and threats in the environment, generating new and creative ideas and making decisions that direct entrepreneurial behaviors (Baron, 2007; Teece, 2007). Research has confirmed a positive relationship between entrepreneurs' perception of opportunities and initiating a new business (Arenius and Minniti, 2005). Entrepreneurs' perceived opportunities vary between countries due to economic development and institutional heterogeneity (Guerrero *et al.*, 2021; De Mello *et al.*, 2022). Therefore, perceived opportunities can generate more entrepreneurial activity and contribute to economic growth in innovation-oriented economies compared to necessity-oriented ones (Ács, 2006; Beynon *et al.*, 2020).

Perceived capabilities refer to the belief of entrepreneurial individuals in developed and developing countries that they possess the necessary competencies (skills, knowledge and experience) to start a business (Bosma *et al.*, 2012a, b). These capabilities positively or negatively affect the success and failure of entrepreneurs (Dutta and Sobel, 2021; Chowdhury *et al.*, 2019; Al Mamari *et al.*, 2022). It has been proposed that entrepreneurs' cognitive schemas direct their ability to identify new opportunities (Baron, 2007). Perceived capabilities are also described as entrepreneurs' self-efficacy, affecting their decision-making processes and organizational performance (Wood and Bandura, 1989; Bryant, 2007). Research has found that such capabilities vary between countries (Beynon *et al.*, 2020; De Mello *et al.*, 2022). While a study conducted in India concluded that individuals' capabilities could be improved through education (Gupta *et al.*, 2014), research in post-socialist developing economies revealed that entrepreneurs' capabilities are lower (Manolova *et al.*, 2008).

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Fear of failure is defined as the initial fear of entrepreneurs (Arenius and Minniti, 2005; Bosma *et al.*, 2012a, b). Entrepreneurs experience fear of failure in the process of starting and developing a business and various studies support this finding (Urbano and Alvarez, 2014; Arabiyat *et al.*, 2019; Al Mamari *et al.*, 2022). This is related to the uncertainty in starting a

business and the resultant risk-avoidance behavior (Arenius and Minniti, 2005; Anwar ul Haq *et al.*, 2014; Turro *et al.*, 2020). Entrepreneurs' fear of failure is likely to vary within a country or between countries due to differences in the institutional context. Indeed, a study conducted in different sub-regions of Spain found that the expression of fear of failure by many individuals in some regions would lead to local differences in national entrepreneurship rates (Vaillant and Lafuente, 2007). A different study conducted in China and Pakistan revealed that entrepreneurial fear could affect entrepreneurial behavior differently in China (Anwar ul Haq *et al.*, 2014). According to the research, while fear of failure was insignificant in China's entrepreneurial activity, it emerged as a substantial factor in Pakistan.

Entrepreneurial intention is an individual's expectation of starting a business (Bosma *et al.*, 2012a, b). These intentions are an essential precursor to entrepreneurial behavior (Souitaris *et al.*, 2007). Studies have questioned the relationship between entrepreneurial intentions and behaviors (Liñán *et al.*, 2011; Arabiyat *et al.*, 2019). Research shows that the effects of cognitive-cultural institutions on entrepreneurial intentions differ in developing and transition economies (Bağış *et al.*, 2023a). Similarly, another study conducted in Spain and Taiwan confirmed that culture significantly differentiates entrepreneurial intentions (Liñán and Chen, 2009). A study in Scandinavia and the USA found that different cultural environments will affect entrepreneurial intentions differently (Autio *et al.*, 2001). The results of these studies suggest that the effects of entrepreneurial intentions on early-stage entrepreneurship in developed and developing economies will be different.

Entrepreneurial employee activity refers to the activities of employees, such as developing or initiating new products or services or establishing a new business unit, organization, or subsidiary (Stam, 2013; Covin *et al.*, 2015). The literature on this subject is also known through studies on corporate entrepreneurship (Jennings *et al.*, 2013), intrapreneurship (Parker, 2011) and strategic renewal (Teece, 2007). Research has concluded that in many developed capitalist economies, entrepreneurial employee activity is more common than independent entrepreneurial activity (Stam, 2013). Different studies suggest that developing countries, on average, have poor performance in innovation indicators, high rates of independent entrepreneurship and low rates of intrapreneurship (Bosma *et al.*, 2012a, b). These studies increase our expectations that entrepreneurial employee activity will differentiate in developed and developing economies.

Motivation is built on individuals' needs, values, desires, goals and intentions and also relies on compensation and rewards that influence these mechanisms. Entrepreneurial motivation refers to the reasons or purposes for executing a particular behavior regarding creating a venture (Levie and Autio, 2008). There is a connection between individuals' needs associated with motivation and the behaviors of entrepreneurs. Motivation is a crucial precursor and cognitive factor for entrepreneurial behaviors (Shane *et al.*, 2003; Estay *et al.*, 2013). The motivations of entrepreneurs in society are shaped by cultural and social environmental conditions (Arafat *et al.*, 2020; Raza *et al.*, 2020). Studies have confirmed the relationships between motivation and entrepreneurial behavior (Shane *et al.*, 2003; Johnson, 1990; Estay *et al.*, 2013).

Entrepreneurship education programs include university education, mentoring for entrepreneurs, field trips, crowdfunding meetings targeted at startup ecosystems, computer simulation applications, etc. and these trainings are provided both during and after school (Dehghanpour Farashah, 2013). The main goal of this education is to enhance the knowledge and skills of people in a country about establishing and operating a new business and to facilitate the dissemination of entrepreneurship knowledge (Busenitz *et al.*, 2000). Research shows that entrepreneurship education programs are effective in entrepreneurial activities (Liñán *et al.*, 2011; Chowdhury *et al.*, 2019; Urban, 2018). One study found that education activities focusing on entrepreneurship positively affected a high growth orientation among entrepreneurs (Bowen and De Clercq, 2008). Education activities mainly provide the

opportunity for entrepreneurs in a country to develop their knowledge and skills, and this situation can boost entrepreneurship activities (Stenholm *et al.*, 2013). The influence of education, especially entrepreneurship education, is likely to be differently affected by the economic development levels of countries.

The variables used in past research indicate that these sets of variables can generally be examined within the context of institutional theory and specifically within the cognitive and cultural dimension of the theory (Bruton *et al.*, 2010; Valdez and Richardson, 2013; Stenholm *et al.*, 2013; Hechavarría and Ingram, 2019; De Mello *et al.*, 2022). Our aim in using these variables is to include more variable sets in the institutional measurement set. In this context, we attempt to explain early-stage entrepreneurial activities with a dataset covering the behaviors and attitudes of entrepreneurs based on international GEM data (Valdez and Richardson, 2013). Taking into account different degrees of influence from cultural values (Hofstede, 1980), we assume that entrepreneurs' perceptions, knowledge and cognitive scenarios related to these activities will reveal differences between developed and developing countries, and this situation will likely affect entrepreneurial activities (Hofstede *et al.*, 2002; Stenholm *et al.*, 2013; Murimbika and Urban, 2014).

In countries with different levels of development, specific subjects and knowledge sets related to entrepreneurship are institutionalized and personal knowledge becomes part of shared social knowledge. This situation confirms that the prevalence of entrepreneurial knowledge is heterogeneous in different societies (Hafer and Jones, 2014; Bosma *et al.*, 2018). In this context, we can assume that cognitive institutions in developed and developing countries will affect the knowledge needed when starting a new business and the ease of access to this information. Additionally, research shows that entrepreneurial activities are suitable in countries where entrepreneurial knowledge is established and incentives are high; otherwise, these activities remain inadequate (Urbano and Alvarez, 2014; De Mello *et al.*, 2022). Based on these findings, we assume that the effects of cognitive-cultural institutions will have a different impact on early entrepreneurship in developed and developing countries. We also argue that the effects of cognitive-cultural institutions will be more effective in developed countries than in developing countries. In this context, we propose the following hypotheses.

H1. Cognitive institutions' impact on early entrepreneurship differs in developed and developing countries.

H1a. Cognitive institutions are more significant in developing early entrepreneurship in developed countries.

H1b. Cognitive institutions have less impact on early entrepreneurship in developing countries than developed countries.

2.1.2 Normative institutions. Normative institutions refer to values and norms that play an essential role in shaping the rules and regulations society imposes on its members (Scott, 1995; North, 1990). This dimension reflects the values and norms associated with moral and ethical systems, grounded in the understanding of what is right and wrong (Busenitz *et al.*, 2000; Orr and Scott, 2008; Bogatyreva *et al.*, 2022). In the context of entrepreneurship, the normative dimension indicates the extent to which a society values entrepreneurial activities and creative, innovative thinking (Busenitz *et al.*, 2000). It evaluates how much admiration exists for entrepreneurship and how it is perceived as a legitimate career choice (Bosma *et al.*, 2018; Wales *et al.*, 2021). These institutions shape people's thoughts about entrepreneurs and influence their perceptions and reactions to individual, legal and managerial factors (Anokhin and Schulze, 2009). Previous studies in entrepreneurship have explored the impact of a country's norms, values and beliefs on the entrepreneurial orientation of its residents

(Busenitz *et al.*, 2000; De Clercq *et al.*, 2010b; Stephan and Uhlaner, 2010; Danis *et al.*, 2011; Wales *et al.*, 2021).

We have identified variables used in previous research to assess the effects of normative institutions on early entrepreneurial behavior. These variables include the perception of entrepreneurship as a desirable career choice, the attribution of high status to successful entrepreneurs and cultural and social norms. Upon reviewing previous studies, we suggest that these variables can generally be associated with institutional theory and specifically with normative dimensions (Bruton *et al.*, 2010; Valdez and Richardson, 2013; Stenholm *et al.*, 2013; Urbano and Alvarez, 2014; De Mello *et al.*, 2022). Normative institutions determine how societies perceive entrepreneurial actions as legitimate endeavors (De Mello *et al.*, 2022).

Perceiving entrepreneurship as a desirable career choice refers to the widespread belief that starting a business is an attractive option (Coduras *et al.*, 2016; Díez-Martín *et al.*, 2016). Previous research has shown that the societal perception of entrepreneurship as a desirable career choice influences individuals' preferences for starting a new business (Abu Bakar *et al.*, 2017; Arabiyat *et al.*, 2019). A career perspective in entrepreneurship focuses on the accumulation of human capital before, during and after engaging in entrepreneurial activities (Burton *et al.*, 2016). It is crucial to examine the contribution of entrepreneurial experience to skills and abilities and its potential consequences for future career opportunities (Parker, 2013; Toft-Kehler *et al.*, 2014). Within normative institutions, the societal view of entrepreneurship as a career choice and its impact on entrepreneurial activities reveals different perspectives of national cultural institutions toward entrepreneurship (Hofstede *et al.*, 2002; Urban, 2018). This situation leads to diversified effects of normative institutions on entrepreneurial activities (Hofstede *et al.*, 2002; Hechavarría and Ingram, 2019; De Mello *et al.*, 2022).

High status for successful entrepreneurs refers to the belief that successful entrepreneurs hold a prominent position in a given country (Stenholm *et al.*, 2013). Cultural environments that perceive entrepreneurship as prestigious, understandable and acceptable legitimize entrepreneurial endeavors (Díez-Martín *et al.*, 2016; Arabiyat *et al.*, 2019). This perception increases the number of individuals who view entrepreneurship as high status and encourages those aspiring to start their businesses. Studies indicate that early-stage entrepreneurship is positively influenced in countries that regard entrepreneurship as high status and prestigious, while it is negatively affected in countries with an opposing view (Stenholm *et al.*, 2013; Díez-Martín *et al.*, 2016).

Cultural and social norms refer to the extent to which these values and norms encourage entrepreneurial activities that enhance personal well-being and wealth (Boudreaux, 2019; Meek *et al.*, 2010). Social norms provide insights into how community and group-level values influence individual entrepreneurs' decisions (Meek *et al.*, 2010). Recent studies have emphasized the need to scrutinize individuals as well as cultural elements such as categories, traditions and discourse (Lounsbury and Crumley, 2007). Findings from previous research have evaluated the influence of cultural and social norms on entrepreneurial activities (Meek *et al.*, 2010; De Mello *et al.*, 2022). The aforementioned variables and studies present a viewpoint that implicitly or explicitly represents normative institutions.

Research indicates that normative institutions exert different impacts on firms and entrepreneurial activities in developed and developing countries (Krueger *et al.*, 2000; Stenholm *et al.*, 2013; Audretsch *et al.*, 2022a; De Mello *et al.*, 2022). Firms engaging in entrepreneurial activities within normatively and culturally supportive institutional environments have distinct advantages in terms of accessing information, establishing strong supplier relationships, entering diverse partnerships and obtaining new business ideas and resources (Stam and Elfring, 2008; Urbano and Alvarez, 2014; Wales *et al.*, 2021). Moreover, it has been established that levels of entrepreneurial intention are more pronounced in countries with mature social structures (Castaño *et al.*, 2015). It has also been

suggested that societal attitudes, beliefs and expectations (Krueger *et al.*, 2000), as well as close social groups such as family, relatives and spouses, along with the broader national culture, influence individuals' entrepreneurial intentions (Stenholm *et al.*, 2013). Conversely, in societies lacking supportive cultural, normative and social structures, entrepreneurial intentions and activities at both the firm and individual levels are likely to be adversely affected.

In developed and developing countries, institutional heterogeneity may influence the relationship between normative institutions and early entrepreneurship (Audretsch *et al.*, 2022a). In developing economies, various factors such as irregularities in business operations, negative perceptions of profit generation from investments (Busenitz *et al.*, 2000) and insufficient measures to combat corruption (Puffer *et al.*, 2016) contribute to the uncertainty surrounding the impact of normative institutions on entrepreneurial behaviors (Urban and Hwindingwi, 2016; Urban, 2018). Therefore, the likelihood of normative institutions exerting a positive influence on early-stage entrepreneurship is higher in developed countries characterized by strong institutional quality compared to developing countries (De Mello *et al.*, 2022; Audretsch *et al.*, 2023b; Haini *et al.*, 2023). Based on these research findings, we hypothesize that the effects of normative institutions will have a differential impact on early entrepreneurship in developed and developing countries. Additionally, we suggest that normative institutions in developed countries will have a more positive effect on early-stage entrepreneurial activities than in developing countries. In light of these considerations, we propose the following hypotheses.

H2. Normative institutions' impact on early entrepreneurship differs in developed and developing countries.

H2a. Normative institutions are more significant in developing early entrepreneurship in developed countries.

H2b. Normative institutions have less impact on early entrepreneurship in developing countries than developed countries.

2.1.3 Regulatory institutions. The regulatory dimension of institutions encompasses legal rules, regulations and public policies. This dimension includes aspects such as entrepreneurial finance, labor market regulations, property rights, venture capital, corruption, commercial laws, business laws, tax regulations and the nature of courts (Bjørnskov and Foss, 2016; Bosma *et al.*, 2018; Chowdhury *et al.*, 2019). In the context of entrepreneurship, the regulatory dimension entails laws, regulations and government policies that support early-stage entrepreneurship, reduce risks for these businesses and facilitate their access to resources, thereby enhancing their sustainability (Busenitz *et al.*, 2000; Darnihamedani *et al.*, 2018; Wales *et al.*, 2021). In our review of past research, we identified variables used to assess the effects of regulatory institutions on early entrepreneurial behavior. These variables include entrepreneurial finance, government policy support and relevance, government policy taxes and bureaucracy, government entrepreneurial programs, research and development transfers, commercial and legal infrastructure, internal market dynamics, entry regulation and physical infrastructure.

Entrepreneurial finance refers to the availability of financial resources for SMEs and new ventures (Hechavarría and Ingram, 2019). Research indicates that the ease or difficulty of accessing finance based on region (Herrington and Coduras, 2019) and gender (Hechavarría and Ingram, 2019) has a positive or negative impact on firms and individual entrepreneurs. In developing economies, financial institutions play a crucial role in promoting entrepreneurship through credit policies and prioritizing national industrial development goals (George and Prabhu, 2000, 2003). Unlike in developed countries where financial resources are relatively abundant, the scarcity of resources in developing countries increases

their value (Chowdhury *et al.*, 2019). However, the effectiveness of these resources can be hindered by poor government decisions regarding venture capital incentives, or their impact may be diminished due to political interests. Additionally, the support provided to firms receiving venture capital in these economies, such as monitoring, auditing, control and mentorship programs, can significantly influence the success of early-stage entrepreneurs (Audretsch *et al.*, 2016).

Countries with well-developed corporate ecosystems and strong financial institutions facilitate the interaction between institutions and entrepreneurs, resulting in easier access to resources and greater encouragement for entrepreneurial activities (Bjørnskov and Foss, 2016; Henrekson and Sanandaji, 2011; Su, 2021; Junaid *et al.*, 2022). On the other hand, unstable financial systems and inadequate institutions in some countries create challenges that hinder entrepreneurs and firms from experimenting and scaling new ventures (Bosma *et al.*, 2018; Wales *et al.*, 2021; Patel and Wolfe, 2022). Improving regulatory institutions is considered to have a more significant impact on the quality of entrepreneurship in developing economies compared to developed ones (Chowdhury *et al.*, 2019). However, research suggests that the influence of regulatory institutions is relatively stronger in developed countries than in developing countries (Wennekers *et al.*, 2005; De Mello *et al.*, 2022). This discrepancy can be attributed to the inclusive nature of regulatory institutions in developed countries and their greater support for innovative entrepreneurial activities (Acemoglu and Robinson, 2012).

Government policy support and relevance, government policy taxes and bureaucracy, government entrepreneurial programs and entry regulation variables are generally defined as the level of support for entrepreneurship by public policies (Bowen and De Clercq, 2008; Arabiyat *et al.*, 2019; Boudreaux *et al.*, 2019; Hechavarría and Ingram, 2019; De Mello *et al.*, 2022). Research reveals that the incentives provided by public policies to new firms facilitate innovation activities (Storey, 2003). Furthermore, state regulations in trade laws, market entry-exit regulations and tax policies have been found to affect firms' transaction costs and their reaction times to market opportunities (Acs *et al.*, 2008; Hechavarrí a and Ingram, 2019; Chowdhury *et al.*, 2019; De Mello *et al.*, 2022). In developing economies, startups often face challenges at the initial stages due to high transaction costs, entry barriers, excessive taxes and cumbersome bureaucratic processes (Puffer *et al.*, 2016; Chowdhury *et al.*, 2019; Busenitz *et al.*, 2000; Manolova *et al.*, 2008). Furthermore, unfavorable bankruptcy laws complicate the exit process for enterprises in these economies (Peng *et al.*, 2010). Conversely, developed countries have established regulations aimed at protecting and enhancing enterprises. Research highlights the facilitation of venture capital for technology companies by European governments (Cumming *et al.*, 2017), as well as the provision of financial resources by the American Government to support the innovation and sustainability of small businesses (Cooper, 2003). These government policies in developed countries have fostered a favorable environment for enterprises, addressing the supply-side challenges they face.

R&D transfer, another regulatory agency, refers to "the extent to which national research and development lead to new commercial opportunities and to what extent it is accessible to SMEs" (Amorós and Bosma, 2014, p. 45; Sá and De Pinho, 2019). Research shows that R&D transfer facilitates the entry of new firms into the market by influencing the flow of information (Amorós *et al.*, 2019b). Furthermore, facilitating the innovation processes of research and development (R&D) transfers positively affects the competitiveness of SMEs and newly established companies (Audretsch and Caiazza, 2016). The transfer of R&D activities has been found to vary based on the economic development level of countries (Sá and de Pinho, 2019). This finding leads us to propose that the impact of R&D transfers on early-stage entrepreneurship will differ depending on the level of economic development. Previous research has indicated that entrepreneurship tends to thrive in economies where the transfer of knowledge from established companies to entrepreneurs is swift and cost-

effective, as opposed to countries where this process is slow and expensive (Hechavarría and Ingram, 2019).

Commercial and legal infrastructure refers to the legal and commercial services and institutions that support SMEs. In contrast, physical infrastructure is defined as SMEs' equal access to physical resources such as communications, utilities, transportation and land (Hechavarría and Ingram, 2019). Research demonstrates that commercial and legal infrastructure is crucial for startups in organizing and executing relationships with various stakeholders such as subcontractors, suppliers, consultants and banks (Levie and Autio, 2008). Moreover, access to legal services during the establishment of the firm (Ruef, 2005) and the convenience provided by bankruptcy laws in the exit process (Lee *et al.*, 2011) positively influence the entrepreneurial activity process. Studies indicate that the presence of entrepreneur-friendly and modern bankruptcy laws in developing economies enhances trust in legal regulations when making credit and investment decisions (Peng *et al.*, 2010). Similarly, a study conducted in developed countries found that bankruptcy laws have a statistically and economically significant impact on entrepreneurship rates, even after controlling for factors such as GDP growth, stock returns and various legal and economic aspects (Armour and Cumming, 2008). Formal institutions, such as the rule of law and control over state corruption, have been shown to influence individuals' motivation to become entrepreneurs (Levie and Autio, 2011; Weng *et al.*, 2021). For instance, Bradley *et al.* (2021) argue that entrepreneurs and firms can safeguard themselves against potential challenges in countries with well-established legal frameworks. Another study by Junaid *et al.* (2022) highlights that weak market institutions exert a stronger influence on entrepreneurial intentions, nascent entrepreneurial activities, new business ventures and startups compared to weak government institutions in developing countries. Based on these findings, we suggest that commercial and legal infrastructure differentiates between developed and developing countries.

Internal market dynamics focus on the speed of market change. Higher entrepreneurial activities are observed in countries where these dynamics change rapidly (Hechavarría and Ingram, 2019). In particular, regulatory activities that affect the rapid change in market dynamics impact entrepreneurship rates. Studies investigating this subject have found that market dynamics have varying effects on entrepreneurship depending on whether economies are oriented toward factors, productivity, or innovation (Martínez-Fierro *et al.*, 2016). We contend that countries experiencing rapid changes in market dynamics are likely to exhibit higher levels of entrepreneurial activity, whereas those with stagnant market conditions are likely to have lower levels of entrepreneurial activity (Hechavarría and Ingram, 2019). Furthermore, research suggests that barriers to market entry are negatively associated with overall entrepreneurial activity across different economies (Sobel *et al.*, 2007). Considering these findings, we acknowledge that factors related to domestic market dynamics will have distinct impacts on entrepreneurial activities in developed and developing countries.

In the studies and variables we have examined, a perspective explicitly or implicitly embodies regulatory institutions. Consequently, this inference provides an opportunity to examine the variables within the GEM data within the framework of institutional theory, with a specific focus on regulatory institutions. Based on this research, we hypothesize that the effects of regulatory institutions will differ on early entrepreneurship in developed and developing countries. Additionally, we suggest that regulatory institutions in developed countries will positively influence early-stage entrepreneurial activities compared to those in developing countries. In this regard, we propose the following hypotheses.

H3. Regulative institutions' impact on early entrepreneurship differs in developed and developing countries.

H3a. Regulative institutions are more significant in developing early entrepreneurship in developed countries.

H3b. Regulative institutions have a lesser impact on early entrepreneurship in developing countries than in developed countries.

2.2 Macroeconomic indicators and entrepreneurial activity

2.2.1 Macroeconomic stability. The emergence of productive entrepreneurial activities within macroeconomic systems is shaped by the ease or difficulty of institutional arrangements and the macroeconomic arrangements created by society for these activities (Burns and Fuller, 2020). Studies examining the effects of macroeconomic variables on TEA have yielded mixed results. Our study divided macroeconomic indicators into two categories: macroeconomic stability and instability. Under macroeconomic stability, we examined the growth rate, GDP per capita and total exports.

Economic growth refers to the positive increase in national income and per capita generated in a country from one year to the next (Acs *et al.*, 2012). Some researchers have suggested that economic growth negatively impacts entrepreneurship (Charfeddine and Zaouali, 2022). In contrast to this finding, some studies argue that increased economic activity and growth create positive financial expectations, improving job opportunities for individuals with entrepreneurial intentions (Galindo and Méndez-Picazo, 2013; Castaño *et al.*, 2015). The relationship between economic growth and entrepreneurship varies according to the institutional contexts of developed and developing countries (North, 1990).

GDP per capita refers to the annual income per capita (Erken *et al.*, 2018). While one study suggests that an increase in the GDP will affect the qualitative characteristics of domestic demand (Radosevic and Yoruk, 2013), other authors have concluded that GDP per capita may be negatively related to the overall entrepreneurial activity (Carree *et al.*, 2007; Uhlaner and Thurik, 2010). These results can be attributed to the differences in the developmental stages of countries. For instance, developed economies typically feature stable demand and intense competition, while developing economies are characterized by uncertain demand, dynamic market trends and rapid growth (Burgess and Steenkamp, 2006; Saeed *et al.*, 2014).

Export-oriented entrepreneurial activities in a country appear to be positively associated with economic growth (González-Pernía and Peña-Legazkue, 2015). Hessels and Van Stel (2011) examined the role of export-oriented entrepreneurship at the country's aggregate level. Their findings revealed that export-oriented entrepreneurial activity is a relevant driver of economic growth in developed countries but not in emerging economies. Some studies have concluded that the impact of the institutional context on export-oriented entrepreneurship can differ significantly depending on the level of corruption in developed and developing countries (Chowdhury *et al.*, 2015; Audretsch and Chowdhury, 2020). Manolova *et al.* (2008), in their studies investigating differences between countries, suggested that political, social and economic conditions determine the relationship between export and entrepreneurship. In separate research, Bahl *et al.* (2021) found that the stage of development characterizing transition economies affects opportunity-oriented entrepreneurs who must balance between innovation and internationalization. These studies suggest a potential connection between exports and early entrepreneurship in developed and developing countries. Based on these discussions, we propose the following hypotheses.

H4. The impact of macroeconomic indicators on early entrepreneurship differs in developed and developing countries.

H4a. Macroeconomic indicators are more significant in developing early entrepreneurship in developing countries.

H4b. Economic stability indicators (growth rate, GDP per capita and total exports) positively affect early entrepreneurship in both developed and developing countries.

2.2.2 Macroeconomic instability. Within macroeconomic instability, we assessed eight variables: current account balance, gross debt stock, total imports, unemployment rate, consumer prices, gross national savings, domestic investment expenditures and population. The current account deficit indicates the balance of payments current account balance. A current account deficit or surplus can contribute to improving the investment environment (Jaumotte and Sodsriwiboon, 2010). Some studies conducted in developed countries suggest that the current deficit balance does not consistently foster entrepreneurship (Liargovas *et al.*, 2022). However, other studies indicate that the current account balance positively affects the emergence and development of entrepreneurial activities (Adrangi *et al.*, 2002). An analysis evaluating the state of SMEs, which examines the political, economic and social conditions in seven developing European economies, concluded that the current account surplus compensates for the low domestic investment rate while increasing current account deficits pose significant challenges for investments and new enterprises (Weiss and Welsh, 2013). These findings raise questions about the relationship between the current account balance and early entrepreneurship as a macroeconomic factor in both developed and developing countries.

Gross debt stock refers to a country's total debt in dollars. Some studies have found that an increasing debt stock may have a negative impact on economic growth and the borrowing country's development (Akram, 2015; Agyapong and Bedjapeng, 2020). On the other hand, other studies have identified a positive relationship between external debt stock and economic growth (Zaman and Arslan, 2014; Agyapong and Bedjapeng, 2020). Considering the relationship between economic growth and entrepreneurship, it can be inferred that the debt stock may either encourage or hinder early-stage entrepreneurs. Research on this subject has concluded that high debt levels in developed economies negatively affect economic growth (Reinhart and Rogoff, 2010). In many developing economies, low national savings rates lead to reduced investment and entrepreneurship rates. In such cases, countries seek to support the private sector and new ventures through foreign borrowing (Agyapong and Bedjapeng, 2020). In this context, we can suggest that there is a connection between a country's gross debt stock and early entrepreneurship.

Total imports represent the volume of imports. A study on firm entry and exit in Belgian manufacturing industries found that import competition and foreign direct investment suppress the entry of domestic entrepreneurs and encourage their exit (De Backer and Sleuwaegen, 2003). However, some studies have concluded that importing digitally offered services positively impacts women's entrepreneurship in European countries (Gaweł and Mińska-Struzik, 2023). For instance, Zhakupov *et al.* (2023) discussed the components that influence the successful development of the entrepreneurial environment in Kazakhstan. The authors concluded that SMEs focus on importing goods into the country for resale rather than producing them, and they suggested encouraging young entrepreneurs and startups. From the results of these studies, it can be observed that imports in a country can have both positive and negative effects. However, in general, the entrepreneurial spirit is seen as lacking, and the rates of new entrepreneurship are insufficient in countries dependent on imports. In this context, we can hypothesize that imports will negatively impact young, early-stage entrepreneurs in both developed and developing countries.

Unemployment refers to the population that wants to work but cannot find a job. While there are studies claiming that increases in the unemployment rate lead to more entrepreneurial activity (Charfeddine and Zaouali, 2022), there are also those claiming that it leads to a decrease in the rate of new business ownership (Hameed *et al.*, 2022). These results

demonstrate that the relationship between unemployment and entrepreneurship has both positive and negative consequences (Parker, 2018). The relationship between unemployment and entrepreneurship is characterized by uncertainty and researchers generally mention a two-way relationship (Thurik, 2003). Studies have confirmed the validity of these two models (Audretsch *et al.*, 2001). Therefore, the nature of the relationship between unemployment and total entrepreneurship cannot be determined theoretically and becomes an empirical question with many nuances (Arin *et al.*, 2015; Ragmoun, 2023). For this article, we focus on the impact of unemployment on entrepreneurship and acknowledge that unemployment will negatively affect entrepreneurship in both developed and developing countries.

The Consumer Price Index measures the average changes in the prices of products and services consumers purchase (Arin *et al.*, 2015). Some studies argue that inflation is a factor that negatively affects entrepreneurs' profits by increasing transaction costs. According to these studies, inflation is both a source and a result of macroeconomic instability (Charfeddine and Zaouali, 2022; Léon, 2019). Inflationary pressures, in particular, make the business environment riskier, negatively impacting the return on investments and making it difficult to form accurate market expectations (Fan *et al.*, 2023). This, in turn, becomes a significant deterrent factor for entrepreneurs (Parker, 2011). A study conducted in the United States found a significant negative correlation between inflation rates and employment percentages in small businesses (Robbins *et al.*, 2000). Another study revealed a negative and significant relationship between inflation and entrepreneurship (Arin *et al.*, 2015). Based on the results of these research studies, we assume that volatility in inflation will adversely affect early-stage entrepreneurship in both developed and developing countries.

Gross national savings represent domestic savings, while domestic investment expenditures indicate increases in capital stock. Higher gross national savings rates in countries are expected to enhance domestic investment expenditures and stimulate entrepreneurship. Research demonstrates that changes in the personal savings rate over time in the United States can account for differences in entrepreneurship rates (Shane, 1996). Similarly, a study comparing Northern European countries (Finland, Netherlands, Norway, Sweden) with Southern European countries (Spain, Greece, Italy and Portugal) revealed that Northern Europe achieved better results in terms of innovation and entrepreneurship. The study also found a direct and positive relationship between gross national savings, per capita R&D expenditures and these outcomes (Medeiros *et al.*, 2020). As per capita income and savings rates increase, entrepreneurial activity also rises (Van Stel *et al.*, 2005). Exporting entrepreneurs have been found to yield the highest profits and economic savings rates (Tang, 2020). Furthermore, it has been established that gross national savings and domestic investment expenditures exert a significant positive effect on economic growth and entrepreneurship, facilitating investment, production and employment and ultimately contributing to more sustainable economic development (Ribaj and Mexhuani, 2021).

Despite the positive effects of savings rates and domestic investments on entrepreneurial activities, some studies have revealed problems associated with the savings rates of countries. For instance, a study examining the factors influencing the gross domestic savings rates of various countries such as Pakistan, China, Singapore, Japan, Turkey and Russia suggests that governments should implement policies that promote investment, encourage savings and enhance production to achieve economic growth targets (Khan *et al.*, 2017). Furthermore, another study found that the age dependency ratio and inflation have a negative impact on gross domestic savings (Khan *et al.*, 2018). Based on these studies, we acknowledge that deficiencies in savings rates and domestic investment expenditures in both developed and developing countries will have a negative impact on early-stage entrepreneurship.

The population represents the total number of individuals in a country. Research investigating the impact of population growth and density on entrepreneurship has yielded

conflicting results. Some studies have revealed that while an increase in population size may lead to future demand for goods and services, entrepreneurial activities can be negatively affected if it creates excessive competition for limited resources (Lévesque and Minniti, 2011). However, other studies have determined that population growth can positively affect entrepreneurship (Florida, 2003; Millan *et al.*, 2014). Additionally, it has been concluded that factors such as the quality of human capital (Arin *et al.*, 2015), the education level of entrepreneurs and the characteristics of the population in which they reside (Millan *et al.*, 2014) influence entrepreneurial activities and rates. Studies examining the relationship between a country's population and entrepreneurship have not provided a clear picture. In this context, it can be hypothesized that entrepreneurial activities will be negatively affected, particularly in developed countries, due to population aging and in developing countries due to excessive population growth, insufficient quality of human capital and inadequate education levels (Johansen and Schanke, 2013). Considering the adverse effects of the variables discussed in the reviewed literature on entrepreneurial activities in developed and developing economies, we propose the following hypothesis.

H4c. Economic instability indicators (current account balance, gross debt stock, total imports, unemployment rate, consumer prices, gross national savings, domestic investment expenditures and population) negatively affect early entrepreneurship in developed and developing countries.

3. Methodology

3.1 Data

The data for the research were obtained from the GEM and IMF databases. Firstly, the GEM is the only globally compatible dataset studying entrepreneurial behavior worldwide (De Mello *et al.*, 2022). This international project dataset examines the breadth of entrepreneurial activities across borders and the impact of countries' activities on entrepreneurship (Reynolds *et al.*, 2005; Ruiz *et al.*, 2016; Raza *et al.*, 2020). The GEM database, which provides rich, reliable and valid data, is frequently used among entrepreneurship researchers to examine entrepreneurial activities (Acs *et al.*, 2018; Beynon *et al.*, 2020; Audretsch *et al.*, 2022a, b; De Mello *et al.*, 2022). For this reason, GEM Adult Population Survey (APS) and GEM National Expert Survey (NES) data were used to examine the impact of institutions on early-stage entrepreneurial activities. GEM APS data consist of variables related to entrepreneurial behavior and attitudes, while GEM NES data consist of variables related to entrepreneurial framework conditions. Relevant data were collected from https://www.gemconsortium.org/wiki/1154.

Secondly, IMF data include variables related to macroeconomic indicators. These data were retrieved from https://www.imf.org/en/Publications/WEO/weo-database/2022/April/download-entire-database. This database is frequently used in research on macroeconomic indicators and entrepreneurship, and it provides reliable, rich and valid data (Easterly, 2005; Charfeddine and Zaouali, 2022).

3.2 Sample and variables

The data utilized in the analysis spans from 2009 to 2018 and encompasses four models: Model 1 comprises data from 26 developed and 16 developing countries, examining the impact of cognitive institutions on Total Early-stage Entrepreneurial Activity (TEA); Model 2 includes 19 developed and 16 developing countries, focusing on the effects of normative institutions on TEA; Model 3 investigates the influence of regulatory institutions for entrepreneurs on TEA, with an analysis involving 27 developed and 17 developing countries;

Model 4 is designed to assess the effect of macroeconomic indicators on TEA and includes 27 developed and 17 developing countries.

The selection of developed and developing countries as samples aimed to facilitate a comparison of institutions and macroeconomic indicators at two distinct levels of economic development. However, an equal number of countries could not be included for all four models in the analysis due to two constraints on the datasets. Firstly, data availability across all surveys is complicated, resulting in data gaps (Hechavarría and Ingram, 2019; Junaid *et al.*, 2022; De Mello *et al.*, 2022). Secondly, some countries in the GEM lack data for specific years (Bjørnskov and Foss, 2016).

The classification of developed and developing countries in this study was based on the data provided by the World Bank, specifically the World Bank Country and Lending Groups (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups). According to this classification, countries with a per capita income of less than $1,085 are categorized as low-income economies, countries with incomes ranging from $1,086 to $4,255 are classified as lower-middle-income economies, countries with incomes ranging from $4,256 to $13,205 are considered upper-middle-income economies, and countries with $13,205 and above fall into the high-income category.

In this study, countries with a per capita income ranging from $4,256 to $13,205 were evaluated as developing countries, while countries with a per capita income of $13,205 and above were classified as developed. The research was conducted on high-income (developed) and upper-middle-income (developing) economies. The GEM dataset's economic development level is based on the stages identified in the World Economic Forum's Global Competitiveness Report. According to this classification, high-income (developed) economies are considered innovation-driven, characterized by advanced innovation, knowledge-intensive businesses and a service-oriented economy (Wennekers *et al.*, 2005; El Ghak *et al.*, 2021; Smallbone *et al.*, 2022). Upper-middle-income (developing) economies are classified as efficiency-driven, characterized by increasing competitiveness, efficient production processes and improved product quality (Wennekers *et al.*, 2005; Pinho, 2017; Zhang and Wang, 2019). The grouping of developed and developing countries included in the analysis is presented in Table 1. Additionally, Table 2 provides detailed information on the dependent variable, independent variables and their definitions used in the study.

3.3 Analysis

The most commonly used method for estimating the impact of multiple independent variables on a single dependent variable is multiple regression analysis. Multiple regression analysis is well-suited for time series analysis, but it is not suitable for panel data analysis (Wooldridge, 2010). The term "panel data" refers to datasets that contain information about the same decision-making units (cross-sectional information) over multiple periods (Maddala,

Classification	Countries
Developed countries	Australia, Belgium, Chile, Finland, France, Germany, Greece, Hungary, Ireland, Israel Italy, Japan, Latvia, the Netherlands, Norway, Poland, Portugal, South Korea, Slovakia, Slovenia Spain, Sweden, Switzerland, Taiwan, the United Kingdom, the United States of America and Uruguay
Developing countries	Argentina, Bosnia Herzegovina, Brazil, China, Colombia, Ecuador, Guatemala, Iran, Malaysia, Mexico, Panama, Peru, Russia, South Africa, Thailand and Turkey

Source(s): Created by authors according to the World Economic Forum's Global Competitiveness Report

Table 1. Developed and developing country classification

Dependent variables		Source
Total Early-Stage Entrepreneurial Activity (TEA) D*	Percentage of the 18–64 population who are either a nascent entrepreneur (involving in setting up a business) or owner-manager of a new business (up to 3.5 years old)	GEM APS
Independent Variables	*Cognitive Institutions (Model 1)*	*Source*
Perceived Startup Opportunities (PSO)	Percentage of the 18–64 population (individuals involved in any stage of entrepreneurial activity excluded) who see good opportunities to start a firm in the area where they live	GEM APS
Perceived Capabilities (PC)	Percentage of the 18–64 population (individuals involved in any stage of entrepreneurial activity excluded) who believe they have the required skills and knowledge to start a business	GEM APS
Fear of Failure (FoF)	Percentage of 18–64 population (individuals involved in any stage of entrepreneurial activity excluded) who indicate that fear of failure would prevent them from setting up a business	GEM APS
Entrepreneurial Intentions (EI)	Percentage of 18–64 population (individuals involved in any stage of entrepreneurial activity excluded) who are latent entrepreneurs and who intend to start a business within three years	GEM APS
Entrepreneurial Employee Activity (EEA)	Rate of involvement of employees in entrepreneurial activities, such as developing or launching new goods or services or setting up a new business unit, a new establishment, or a subsidiary	GEM APS
Entrepreneurship Motivation Index (EMI)	Percentage of those involved in TEA that is improvement-driven opportunity motivated, divided by the percentage of TEA that is necessity-motivated	GEM APS
Entrepreneurial Education at School (EES)	The extent to which training in creating or managing SMEs is incorporated within the education and training system at primary and secondary levels. The measurement of this variable is given by the country-level average of experts' perceptions following a nine-point Likert scale	GEM NES
Entrepreneurial Education Post-School (EEPS)	The extent to which training in creating or managing SMEs is incorporated within the education and training system in higher education such as vocational, college, business schools, etc.	GEM NES
Independent Variables	*Normative Institutions (Model 2)*	*Source*
Entrepreneurship as a Good Career Choice (EGCC)	Percentage of 18–64 population who agree with the statement that in their country, most people consider starting a business as a desirable career choice	GEM APS
High Status to Successful Entrepreneurs (HSSE)	Percentage of 18–64 population who agree with the statement that in their country, successful entrepreneurs receive high status	GEM APS
Cultural and Social Norms (CSN)	The extent to which social and cultural norms encourage or allow actions leading to new business methods or activities that can potentially increase personal wealth and income	GEM APS
Independent Variables	*Regulative Institutions (Model 3)*	*Source*
Entrepreneurial Finance (EF)	The availability of financial resources—equity and debt—for small and medium enterprises (SMEs) (including grants and subsidies). Are there sufficient funds for new startups?	GEM NES
Government Policy: Support and Relevance (GPRS)	The extent to which public policies support entrepreneurship - entrepreneurship as a relevant economic issue. The measurement of this variable is given by the country-level average of experts' perceptions following a nine-point Likert scale	GEM NES

Table 2.
Definitions of variables

(*continued*)

Dependent variables		Source
Government Policy: Taxes and Bureaucracy (GPTB)	The extent to which public policies support entrepreneurship - taxes or regulations are either size-neutral or encourage new SMEs. The measurement of this variable is given by the country-level average of experts' perceptions following a nine-point Likert scale	GEM NES
Government Entrepreneurial Programs (GEP)	The presence and quality of programs directly assist SMEs at all levels of government (national, regional, and municipal). The measurement of this variable is given by the country-level average of experts' perceptions following a nine-point Likert scale	GEM NES
Research and Development Transfers (RDT)	The extent to which national research and development will lead to new commercial opportunities is available to SMEs. The measurement of this variable is given by the country-level average of experts' perceptions following a nine-point Likert scale	GEM NES
Commercial and Legal Infrastructure (CLI)	The presence of property rights, commercial, accounting, and other legal and assessment services and institutions that support or promote SMEs. The measurement of this variable is given by the country-level average of experts' perceptions following a nine-point Likert scale	GEM NES
Internal Market Dynamics (IMD)	The level of change in markets from year to year	GEM NES
Entry Regulation (ER)	The extent to which new firms are free to enter existing markets	GEM NES
Physical Infrastructure (FI)	Ease of access to physical resources—communication, utilities, transportation, land, or space—at a price that does not discriminate against SMEs	GEM NES
Independent Variables	*Macroeconomic Indicators (Model 4)*	*Source*
Growth Rate (GR)	It is the economic growth rate and shows the percentage change in real gross domestic product	IMF
Gross domestic product per capita (GDPPC)	It is the level of gross domestic product per capita and is expressed in US dollars	IMF
Total Exports (TE)	Percent change of volume of export	IMF
Current Account Balance (CAB)	It shows the current account balance in the balance of payments	IMF
Gross Debt Stock (GDS)	It expresses the gross debt stock of countries in dollars	IMF
Total Imports (TI)	Percent change of volume of imports	IMF
Unemployment Rate (UR)	It shows the unemployment rate	IMF
Consumer Price Index (CPI)	It measures the average changes in the prices of a particular set of products and services purchased by a consumer	IMF
Gross National Savings (GNS)	Represents domestic savings	IMF
Domestic Investment Expenditures (DIE)	It is domestic investment expenditures and shows the increases in the capital stock	IMF
Population (p)	Shows the country's population	IMF

Note(s): *Methodological notes:* The GEM APS (Adult Population Survey) consists of data collected with at least 2,000 adults in each country, ensuring the national representativeness of data. The GEM NES (National Expert Survey) gathers information on framework conditions for entrepreneurial activity with carefully chosen experts. NES data are based on average scores given to Likert-scale statements based on levels of agreement

Source(s): *GEM APS:* Global Entrepreneurship Monitor, Adult Population Survey: https://www.gemconsortium.org/report

GEM NES: Global Entrepreneurship Monitor, National Expert Survey Report: https://www.gemconsortium.org/report

IMF: Macroeconomic Indicators: https://www.imf.org/en/Publications/WEO/weo-database/2022/April/download-entire-database

Definitions of entrepreneurial behavior, attitudes and entrepreneurial framework taken from https://www.gemconsortium.org/wiki/1154

Table 2.

2001; Baltagi, 2013). Panel studies offer several advantages: they allow for analyzing both micro and macro issues, as they provide a combination of individual-level and aggregate-level data. Panel studies also enable the expansion of the analysis by increasing the dataset size. Additionally, panel data allows for the examination of the causal factors of the phenomena under investigation, the observation of the dynamics of these phenomena and the control of unobservable individual effects in regression models (Hsiao, 2007; Szwacka, 2020).

A growing body of literature on panel-data analysis indicates that models utilizing panel data likely exhibit significant cross-sectional dependence in their error terms (Pesaran, 2007; Baltagi, 2005). One possible explanation for this observation is the increasing economic and financial integration among countries and financial entities, leading to strong interdependencies between cross-sectional units. This finding carries notable implications: if one opts to pool a set of cross-sectional units that are homogeneous concerning slope parameters but fails to account for cross-sectional dependence, the efficiency gains otherwise expected—compared to running separate ordinary least squares (OLS) regressions for each cross-section—may be substantially reduced. Consequently, testing for cross-sectional dependence is crucial when working with panel data models.

In analyzing panel data, there are three commonly used techniques: Pooled OLS regression, fixed-effects model (FEM) and random effects model (REM) (Baltagi, 2005; Hsiao, 2014). The selection of the appropriate panel model is guided by panel diagnostic tests (Baltagi, 2005; Jaba *et al.*, 2017). The *F*-test is employed to decide between the pooled OLS and FEMs, while the Lagrange Multiplier (LM) test is used to choose between the pooled OLS and REMs. If the null hypothesis of the *F*-test and LM test is not rejected, then the pooled OLS model is considered the most suitable. If the *F*-test is rejected, but the LM test is not, then the FEM is preferred. Conversely, if the LM test is rejected while the *F*-test is not, then the REM is appropriate. However, if both the *F*-test and LM test are rejected, a Hausman test is conducted to compare the FEM and REM. Figure 1 provides a summary of the modeling process.

Standard panel data analysis includes several steps. First, whether the series forming the model contains a unit root is determined. The second step estimates the panel

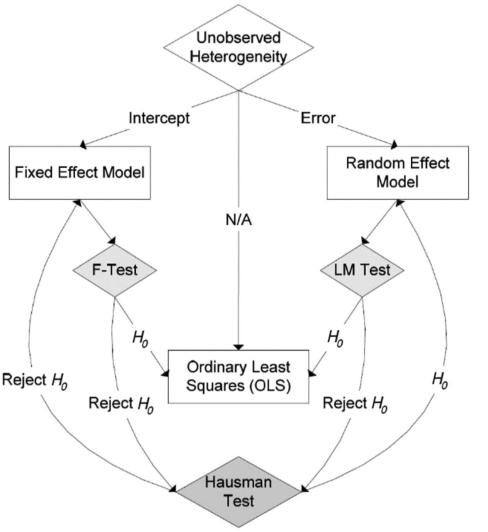

Figure 1.
Panel data modeling process

Source(s): Figure 1 belongs to Park (2011, p. 16)

regression model (fixed effects or random effects) using the least squares method (OLS) (Park, 2011, p. 16). Whether the FEM or the REM is valid is determined by the Hausman test. In the third stage, whether there is a problem of varying variance and autocorrelation in the model is decided; that is, the reliability of the estimated coefficients is tested. Finally, in case of problems, autocorrelation and variable variance resistant estimators are obtained and interpreted (White's test).

Four models have been established to explain TEA in a multidimensional way. All four models were analyzed using the standard panel data analysis method. The basic model used in panel data analysis is as follows (Baltagi, 2005).

$$Y_{it} = a_i + \beta_i X_{it} + u_{it} i = 1, \ldots, N ve\, t = 1, \ldots, T \quad (1)$$

Y_{it}: It expresses the value of the ith unit of the dependent variable at time t and represents the TEA dependent variable in the models. X_{it}: The value of the ith unit of the independent variables in all four models at time t, a_i: constant with unit effects, β_i: refers to the predictive coefficient of the independent variables.

In the panel data method, the stationarity of the series is of great importance in selecting the appropriate model. Therefore, in this study, second-generation Covariate Augmented Dickey–Fuller (CADF) unit root tests, which consider the cross-sectional dependency suggested by Pesaran (2007), were used. The working algorithm of the CADF test is presented in equations 2-5 below.

$$Y_{it} = (1 - \varnothing_i)\mu_i + \varnothing_i Y_{i,t-1} + \mu_{it} i = 1, \ldots, N\, ve\, t = 1, \ldots, T \quad (2)$$

$$\Delta Y_{it} = a_i + \rho_i^* Y_{it-1} + d_0 \overline{Y}_{t-1} + d_1 \Delta \overline{Y}_t + \varepsilon_{it} \quad (3)$$

$$H_1 : \rho_i < 0 \dot{I} = 1, 2, \ldots, N_i ve \beta_i = 0 (N_{i+1}, N_{i+2}, \ldots, N) \quad (4)$$

$$C\overline{ADF} = \frac{\sum_{i=1}^{N} CADF_i}{N};\ CIPS = t - bar = \frac{1}{N}\sum_{i=1}^{N} t_i(N, T) CIPS = \frac{1}{N}\sum_{i=1}^{N} CADF_i \quad (5)$$

Two fundamental approaches are generally employed in estimations made with panel data: the FEM and the REM. In the FEM, the constant term changes according to units, time, or both, while the slope coefficients remain the same across all units and time. This allows for the differences in the behavior of the units to be explained by variations in the constant term. In contrast, from point "3.1. Starting," the slope parameters are the same ($\beta_i = \beta$) for each cross-sectional unit. However, as the constant parameter contains the unobservable unit effect, there are differences between units. The modified Wald test can detect variances in the FEM (Baltagi and Wu, 1999; Maddala, 2001; Baltagi, 2005).

In contrast to FEMs, the REM incorporates the unit effects as random variables, similar to the error term. REMs are models in which there is no fixed coefficient for each cross-section and time, and these effects are treated as random variables. Since the unit effects are considered a component of the error term, it also includes the effects of the units that are not included in the model. It is also referred to as the Error Component Model in the literature (Olanrewaju *et al.*, 2019). Fixed and REMs can generally be expressed by the following equations.

$$\beta_{FE} = \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \left(X_{it} - \overline{X}_i \right)' \left(X_{it} - \overline{X}_i \right) \right)^{-1} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \left(X_{it} - \overline{X}_i \right)' \left(Y_{it} - \overline{Y}_i \right) \right) \quad (6)$$

$$\widehat{\beta}_{RE} = \left(\sum_{i=1}^{N} X_i' \widehat{\Omega}^{-1} X_i \right)^{-1} \left(\sum_{i=1}^{N} X_i' \widehat{\Omega}^{-1} Y_i \right) \tag{7}$$

The Hausman test is used to decide which of the panel data models (Hausman, 1978), the pooled model, FEM and REM will be used. The hypotheses of the Hausman test are $H_0 : E(u_i|X_{it}) = 0$, and the unit and time effects are random. $H_A : E(u_i|X_{it}) \neq 0$, unit and time effects are fixed. REM is considered valid if the p-value >0.05 (Jaba *et al.*, 2017). It is tested with the help of the statistical value suitable for the x^2 distribution with k degrees of freedom.

$$H = \left(\widehat{\beta}_{FE} - \widehat{\beta}_{RE} \right)' \left[Avar\left(\widehat{\beta}_{FE} \right) - Avar\left(\widehat{\beta}_{RE} \right) \right]^{-1} \left(\widehat{\beta}_{FE} \widehat{\beta}_{RE} \right) \tag{8}$$

In the Hausman (H) test statistic, the FEM subindex estimators of the FEM and the REM estimators, as well as the $Avar(\widehat{\beta}_{FE})$ and $Avar(\widehat{\beta}_{RE})$ expressions, represent the asymptotic variance-covariance matrices obtained from the estimation of the FEM and REM, respectively (Sheikhi *et al.*, 2022). If one or both of the variance and autocorrelation problems are detected in the FEM and REM, the standard errors are corrected without changing the parameter estimates and robust (robust) values are obtained. In the Wooldridge autocorrelation test, the existence of autocorrelation in the panel dataset is investigated using the errors obtained from the first-order differences model and the null hypothesis for the test is established as $H_0 : \widehat{\rho} = 0$. There is no first-order autocorrelation. The F-test statistics for the Wooldridge test are given in equation (9).

$$F = \frac{\sum_{i=1}^{N} \sum_{t=1}^{T-1} \sum_{s=t+1}^{T} \widehat{f}_{it} \widehat{f}_{is}}{\sum_{i=1}^{N} \left(\sum_{t=1}^{T-1} \sum_{s=t+1}^{T} \widehat{f}_{it} \widehat{f}_{is} \right)^2} \tag{9}$$

The W test statistic has an asymptotic normal distribution. When the probability value (p-value) obtained as a result of the test is greater than the confidence level (α), the H_0 hypothesis will be accepted, and it will be concluded that there is no autocorrelation. The modified Wald test, developed to investigate the differential spread in fixed-effect models, examines whether the variance changes according to the units under the null hypothesis that the unit variances are equal to the panel mean.

The W test statistic for the Wald test is given in equation (10).

$$W = \sum_{i=1}^{N} \frac{\left(\widehat{\sigma}_i^2 - \sigma^2 \right)^2}{f_{ii}} \tag{10}$$

In equation (10), $\widehat{\sigma}_i^2$ represents the estimator of the error variance of units, and its representation is in equation (11).

$$\widehat{\sigma}_i^2 = \frac{1}{T} \sum_{i=i}^{T_i} e_{it}^2 f_{ii} = \frac{1}{T} \frac{1}{T-1} \sum_{i=1}^{T} \left(e_{it}^2 - \widehat{\sigma}_i^2 \right)^2 \tag{11}$$

The W test statistic fits the N-degrees-of-freedom distribution χ^2. Therefore, when the probability value (p-value) obtained as a result of the test is greater than the confidence level (α), the H_0 hypothesis will be accepted, and it will be concluded that the variance does not change according to the units. Using the method developed by Eicker (1967), Huber (1967)

and White (1980) for resistive estimators, a model with varying variance in error terms and autocorrelation problem is transformed into a suitable structure.

4. Results

The factors influencing TEA in developed and developing countries were determined through the utilization of four distinct models. Firstly, an examination of cross-section dependence in the models was conducted. The cross-section dependency test assumes that a positive shock occurring in any of the units comprising the panel does not affect the other countries within the panel. Since N > T for cross-section dependence, the Pesaran LM test developed by Pesaran (2007) was used. The H_0 hypothesis was established as no cross-sectional dependence exists between the variables. Analysis results are shown in Table 3.

When examining Table 3, cross-section dependency is observed in the first and third models for developed country samples. The second model indicates cross-sectional dependence in both developed and developing countries. However, in the fourth model, no cross-section dependence is identified. For the developing country example, it is evident that there is no cross-sectional dependence in the first, third and fourth models. To obtain efficient estimators, it was necessary to determine which FEM and REM would be valid. As mentioned earlier, in the fixed-effects model, the constant term varies across units or time, while the slope coefficients remain the same across all units and time periods. On the other hand, in the REM, there is no fixed coefficient for each cross-section and time; instead, these effects are treated as random variables. The four models used for efficient parameter estimation are established based on equation 1.

4.1 Model 1

$$TEA_{it} = \beta_0 + \beta_i PSO_{it} + \beta_2 PC_{it} + \beta_3 FoF_{it} + \beta_4 EI_{it} + \beta_5 EEA_{it} + \beta_6 EMI_{it} + \beta_7 EES_{it} + \beta_8 EEPS_{it} + u_{it} \quad (12)$$

4.2 Model 2

$$TEA_{it} = \delta_0 + \delta_i HSSE_{it} + \delta_2 \mathrm{EGCC}_{it} + \delta_3 CSN_{it} + \in_{it} \quad (13)$$

Test	Statistics	Probability	Statistics	Probability
	Model 1 (developed countries)		*Model 1 (developing countries)*	
Pesaran Scaled LM	3.446	0.0006	−0.905	0.3656
	Model 2 (developed countries)		*Model 2 (developing countries)*	
Pesaran Scaled LM	6.429	0.0000	3.618	0.0003
	Model 3 (developed countries)		*Model 3 (developing countries)*	
Pesaran Scaled LM	6.713	0.000	0.103	0.9182
	Model 4 (developed countries)		*Model 4 (developing countries)*	
Pesaran Scaled LM	0.648	0.51172	05.46	0.5854

Source(s): Created by authors

Table 3. Cross section dependency test

4.3 Model 3

$$TEA_{it} = a_0 + \alpha_i EF_{it} + \alpha_2 GPRS_{it} + \alpha_3 GPTB_{it} + \alpha_4 GEP_{it} + \alpha_5 EES_{it} + \alpha_6 EEPS_{it} + \alpha_7 RDT_{it} + \alpha_8 CLI_{it} + \alpha_9 IMD_{it} + \alpha_{10} EEBR_{it} + FI_{it} + \varepsilon_{it} \quad (14)$$

4.4 Model 4

$$TEA_{it} = \partial_0 + \partial_i GR_{it} + \partial_2 \mathrm{GDPPC}_{it} + \partial_3 TE_{it} + \partial_4 CAB_{it} + \partial_5 GDS_{it} + \partial_6 TI_{it} + \partial_7 UR_{it} + \partial_8 CPI_{it} + \partial_9 GNS_{it} + \partial_{10} DIE_{it} + POP_{it} + \theta_{it} \quad (15)$$

Results for the selection of FEM and REM (Hausman test), variance variability, autocorrelation, descriptive statistics and unit root test results are presented in Appendices. We organized the outcomes of the four models according to developed and developing countries. Firstly, we discovered that fixed effects are valid in Model 1, designed to measure the impact of cognitive institutions on TEA, as indicated by the estimation results. Secondly, in Model 2, we analyzed the influence of normative institutions on TEA. In this model, we discovered that random effects are valid in developed countries, while fixed effects hold in developing countries. Thirdly, we concluded that fixed effects are valid in Model 3, established to determine the impact of regulatory institutions on TEA. Finally, we ascertained that random effects are applicable in Model 4, constructed to evaluate the influence of macroeconomic indicators on TEA. We utilized the Hausman test to choose between FEM and REM. We encountered issues of autocorrelation and varying variance in all four models designed for samples from developed and developing countries. Due to inconsistent variance and autocorrelation in the models, we transformed the model into a structure suitable for interpreting the coefficients and obtaining robust estimators. Using the method developed by Eicker (1967), Huber (1967) and White (1980) for robust estimation, we report the results of the analysis below.

Table 4 presents the panel regression analysis results for developed and developing countries. The analysis shows that the coefficients of perceived entrepreneurial opportunities, entrepreneurial intentions and post-school entrepreneurship education for developed countries are positive and statistically significant in Model 1. According to these results, we determined that as the percentage of the 18–64 age group who believe there are good opportunities to establish a company in their region increases, the number of early-stage entrepreneurs also increases (*t-value* = 0.023). Likewise, we concluded that an increase in the percentage of individuals intending to start a business within three years leads to an increase in early-stage entrepreneurs (*t-value* = 4.51). Furthermore, we found that an increase in post-school entrepreneurship education positively influences early-stage entrepreneurship (*t-value* = 2.30). The analysis indicates that the impacts of entrepreneurial intentions and employee activity variables on early-stage entrepreneurs in Model 1 are statistically significant and positive in developing countries. We concluded that an increase in the percentage of individuals intending to start a business within three years leads to an increase in early-stage entrepreneurs (*t-value* = 3.18). Moreover, we found that as entrepreneurial employee activity increased, early entrepreneurial activity also increased (*t-value* = 2.17).

In Model 2, cultural and social norms originating from normative institutions in developed countries demonstrate a statistically positive and significant effect on early-stage entrepreneurship (*t-value* = 3.48). Though we identified a negative relationship between other variables with early-stage entrepreneurship in Model 2, this relationship is not

Table 4.
Results of panel regression analysis

V	Resistant estimators (Developed countries) C	*t*	CI		Resistant estimators (Developing countries) C	*t*	CI	
Cognitive institutions (model 1)								
PSO	*0.03547*	*2.43*	*0.005375*	*0.065565*	0.074022	1.41	−0.03818	0.186227
PC	−0.01186	0.31	−0.09076	0.067049	0.127545	1.07	−0.1263	0.381391
FoF	0.039156	1.44	−0.01687	0.095183	−0.04499	−0.66	−0.19007	0.100093
EI	*0.247946*	*4.51*	*0.134717*	*0.361175*	*0.104526*	*3.18*	*0.034399*	*0.174653*
EEA	0.132408	1.02	−0.13466	0.399478	*1.145448*	*2.17*	*0.019424*	*2.271471*
EMI	0.003492	0.11	−0.06124	0.068222	0.653575	1.20	−0.50703	1.814182
EES	0.059213	0.12	−0.95464	1.073063	−1.81721	−1.16	−5.17011	1.535682
EEPS	*1.110672*	*2.30*	*0.116805*	*2.104539*	2.189185	1.19	−1.74526	6.123633
_cons	−119834	0.43	−6.87533	4.478646	−1.26231	−0.14	−20.9904	18.46579
	R2	0.42			R2	0.309		
	F(8,25)	8.51			F(8,15)	6.04		
	Fprob > F	0.0000			Fprob > F	0.0014		
	rho	0.78805585			rho	0.5136		
Normative Institutions (Model 2)								
HSSE	−0.01078	0.18	−0.13095	−0.01078	0.0172	0.25	−0.12966	0.164056
EGCC	−0.05756	1.7	−0.12394	−0.05756	0.062159	0.55	−0.17747	0.301793
CSN	*1.08464*	*3.48*	*0.474458*	*1.08464*	0.812436	0.62	−1.97897	3.603844
_cons	7.542172	1.66	−1.33876	7.542172	6.010592	0.86	−8.87659	20.89777
	R2	0.1102			R2	0.252		
	Wald χ^2(3)	14.23			F(3,15)	16.15		
	Fprob > χ^2	0.0026			Fprob > F	0.6116		
	rho	0.8375			rho	0.6967		
Regulative Institutions (Model 3)								
EF	*2.010409*	*2.73*	*0.49772*	*3.523098*	−2.01849	−1.26	−5.16826	1.131281
GPSR	*0.518457*	*2.3*	*0.055631*	*0.981283*	−2.41898	−1.81	−5.03373	0.195776
GPTB	*1.341001*	*2.45*	*0.214074*	*2.467928*	−1.05466	−0.63	−4.31132	2.202009
GEP	1.045008	0.84	−1.50638	3.5964	−0.32464	−0.16	−4.36132	3.712044
RDT	*−2.0059*	*−2.16*	*−3.91023*	*−0.10095*	1.124083	0.46	−3.70192	5.950088

(*continued*)

Table 4.

V	Resistant estimators (Developed countries) C	*t*	CI		Resistant estimators (Developing countries) C	*t*	CI	
CLI	1.671274	1.49	−0.6292	3.971744	*−3.95393*	*−2.36*	*−7.24111*	*−0.66676*
IMD	0.240835	0.69	−0.4729	0.954567	−0.2809	−0.23	−2.71843	2.156626
ER	−1.03409	−1.07	−3.01799	0.949817	*4.083348*	*2.05*	*0.178821*	*7.987874*
FI	−0.22245	−0.47	−1.19267	0.747763	1.72591	1.28	−0.90657	4.358388
_cons	−1.55017	−0.37	−10.071	6.970619	22.33185	3.27	8.947385	35.71631
	R2	0.1813			R2	0.1514		
	F(9,26)	13.51			F(11,16)	16.15		
	Fprob > F	0.0000			Fprob > F	0.0000		
	rho	0.84573			rho	0.68111		
Macroeconomic Indicators (Model 4)								
GR	0.064835	1.48	−0.02095	0.150617	*0.313755*	*2.19*	*0.032941*	*0.594569*
GDPPC	1.55E-06	1.68	−2.55E-07	3.36E-06	*7.28E-07*	*3.22*	*2.85E-07*	*1.17E-06*
TE	−0.00404	−0.18	−0.04741	0.03932	*0.141967*	*2.00*	*0.002562*	*0.281371*
CAB	*0.005996*	*2.52*	*0.001338*	*0.010654*	*0.021075*	*2.22*	*0.002495*	*0.039655*
GDS	−1.78E-06	−0.80	−6.14E-06	2.59E-06	*−1.41E-05*	*−2.06*	*−2.76E-05*	*−6.67E-07*
TI	0.022355	1.16	−0.01556	0.060267	*−0.10972*	*−2.67*	*−0.19029*	*−0.02914*
UR	−0.09493	−1.13	−0.26006	0.070198	*−0.25225*	*−2.59*	*−0.44304*	*−0.06146*
CPI	*0.090915*	*3.01*	*0.031703*	*0.150127*	*1.42E-13*	*1.94*	*−1.50E-15*	*2.86E-13*
GNS	−0.05759	−0.91	−0.18192	0.066735	−0.3554	−1.40	−0.85194	0.141134
DIE	−0.00959	−0.14	−0.14862	0.129429	0.024338	0.11	−0.41127	0.459942
POP	−0.01585	−0.94	−0.04872	0.017025	−0.00023	−0.05	−0.00924	0.00878
_cons	−0.3092	−0.09	−6.90407	6.285663	22.58747	4.46	12.65472	32.52023
	R2	0.12986			R2	0.1116		
	Wald $\chi^2(11)$	151.13			LR $\chi^2(10)$	1.94		
	Fprob > χ^2	0.0000			Prob > χ^2	0.014		
	rho	0.88575			rho	0.6470		

Note(s): V: Variables, C: Coefficient, t: *t* value and CI: 95% Confidence Interval
Source(s): Created by authors

statistically significant. In Model 2, we could not identify a statistically significant impact of normative institutions on early-stage entrepreneurship in developing countries.

The results of Model 3, constructed to ascertain the impact of regulatory institutions on early-stage entrepreneurship, reveal that variables of entrepreneurial finance, government policy (support and relevance), government policy (taxes and bureaucracy) and research and development transfer are statistically significant in developed countries. Specifically, increased entrepreneurial finance positively affects early-stage entrepreneurship (*t-value* = 2.73). Furthermore, the variables of government policy (support and relevance) (*t-value* = 2.3) and taxes and bureaucracy (*t-value* = 2.45) appear to exert a statistically significant and positive effect on early-stage entrepreneurship. Conversely, we found that increases in R&D transfers negatively affect early-stage entrepreneurship (*t-value* = −2.16). Model 3 displays the impacts of regulatory institutions on early-stage entrepreneurship in developing countries. Commercial and legal infrastructure significantly influences early-stage entrepreneurship in developing countries. The results show a negative correlation between commercial and legal infrastructure and early-stage entrepreneurship (*t-value* = −2.36). However, a statistically significant positive relationship exists between entry regulations and early-stage entrepreneurship in developing countries (*t-value* = 2.05).

The results of Model 4, established to assess the impact of macroeconomic indicators on early-stage entrepreneurship, indicate that the current account balance and consumer price index variables are statistically significant in developed countries. We found that an increase in the current account balance (i.e. a decrease in the current account deficit) positively influences early-stage entrepreneurship (*t-value* = 2.52). Additionally, we concluded that an increase in the consumer price index positively affects early-stage entrepreneurship (*t-value* = 3.01). Model 4, constructed to evaluate the impact of macroeconomic indicators on early-stage entrepreneurship in developing countries, revealed the effects of eight variables. Our findings suggest positive and statistically significant impacts of growth rate (*t-value* = 2.19), GDP per capita (*t-value* = 3.22), total exports (*t-value* = 2.00), current account balance (*t-value* = 2.22) and consumer price index (*t-value* = 1.94) on early-stage entrepreneurship. Conversely, our findings indicate that variables of gross debt stock (*t-value* = −2.06), total imports (*t-value* = −2.67) and unemployment rate (*t-value* = −2.59) have statistically significant negative effects.

5. Implications and conclusion

5.1 Theoretical implications

Our research examines the institutions and macroeconomic factors affecting TEA in developed and developing countries. The study's results contribute to institutional theory and entrepreneurship literature by linking cognitive, normative and regulatory institutions to macroeconomic indicators and TEA. Interestingly, many cognitive, normative and regulatory bodies did not significantly influence early-stage entrepreneurship, which contradicts expectations. This outcome is surprising, given the importance attributed to cognitive, normative and regulatory institutions in promoting entrepreneurial activities in previous studies. This finding aligns with the results of Hechavarría and Ingram (2019). Furthermore, our findings suggest that the impact of institutions on early-stage entrepreneurship is more positive in developed countries than in developing ones. These findings support the argument that a theory cannot be empirically generalized due to spatial and time constraints (Bacharach, 1989). This evidence underscores the need for context-specific assessments of variables related to institutional theory's cognitive-cultural, normative and regulatory dimensions in both developed and developing countries. We also acknowledge that the greater effectiveness of institutions on TEA in developed countries

can be attributed to the quality of the institutions in these countries (Ragmoun, 2023; Audretsch *et al.*, 2023b).

Firstly, in Model 1, where we examined the impact of cognitive-cultural institutions, we found support for 3 out of 8 variables in developed countries and 2 in developing economies. We determined that perceived startup opportunities, entrepreneurial intentions and post-school entrepreneurial education variables in Model 1 in developed countries and entrepreneurial intentions and school-based entrepreneurial education variables in developing countries, affect early entrepreneurship. Entrepreneurial intentions are the common variable affecting early entrepreneurship in both developed and developing economies. We identified variables with differing effects, such as perceived startup opportunities, post-school entrepreneurial education in developed countries and school-based entrepreneurial education in developing countries. In this respect, our results suggest that the impact of cognitive institutions differs according to the level of economic development. Our H1 hypothesis was partially supported. However, our results confirm that cognitive institutions positively impact early entrepreneurship, and this effect is more pronounced in developed countries than in developing countries. In this respect, our H1a and H1b hypotheses are partially supported. We found that perceived startup opportunities in Model 1 positively impacted TEA in developed countries but not developing countries. Analysis results are consistent with De Mello's (2022) research. One potential reason for this outcome could be that advanced economies are more prone to opportunity-driven entrepreneurship while emerging economies are more inclined toward necessity-driven ventures (Afi *et al.*, 2022). Considering this, it can be thought that early-stage entrepreneurs in developed countries may better perceive opportunities in their environment. Another factor could be that our data starts in 2009, suggesting that the effects of the economic crisis in 2008 may have influenced early-stage entrepreneurial activities (Beynon *et al.*, 2020). During this period, early-stage entrepreneurs in developed countries might have better grasped the opportunities during the crisis than those in emerging economies. Differences in countries' responses to crises could also have contributed to this result. The impact of entrepreneurial intentions on early entrepreneurship in both developed and developing economies in Model 1 supports past research findings (De Mello *et al.*, 2022; Guerrero *et al.*, 2021; Junaid *et al.*, 2022). We also corroborate the results of previous research that evaluated the cognitive dimension as an informal institution (Aparicio *et al.*, 2016). Moreover, we concluded that perceived opportunities and school-based entrepreneurial education variables in developed countries significantly influence TEA more than in developing countries. In this regard, our findings align with previous research, which indicated that institutional quality and economic development influence opportunity entrepreneurship (Amorós *et al.*, 2019a; Fuentelsaz *et al.*, 2015; Valdez and Richardson, 2013) and early-stage entrepreneurship (Velilla and Ortega, 2017; Bosma *et al.*, 2018; De Mello *et al.*, 2022).

Secondly, in Model 1, when evaluating the effect of normative institutions on early-stage entrepreneurship, it is apparent that this impact varies between developed and developing countries. In this respect, H2 is partially supported. The research results reveal that cultural and social norms positively influence early-stage entrepreneurship in developed countries. Consequently, normative institutions seem more effective in early-stage entrepreneurship in developed countries than in developing ones. However, the research results show that normative institutions do not impact developing countries. Contrary to previous research in developed countries (Stenholm *et al.*, 2013; Hechavarría and Ingram, 2019; De Mello *et al.*, 2022), our findings partially support H2a and H2b hypotheses. We found no impact of the "high status of successful entrepreneurs" variable on early-stage entrepreneurship in developed or developing countries. Our results align with past research (Stenholm *et al.*, 2013; De Mello *et al.*, 2022). However, we found that cultural and social norms influence early-stage entrepreneurship in developed countries. In this respect, our findings diverge from the results

of previous research (Stenholm *et al.*, 2013; Hechavarría and Ingram, 2019; De Mello *et al.*, 2022). These results confirm that national cultural differences affect entrepreneurial activities (Kabir *et al.*, 2023; İpek *et al.*, 2023; Maleki *et al.*, 2021). In addition, the results give the impression that there is a social structure in developed countries where cultural and social norms support new entrepreneurs. Considering that the rate of change of cultural and social norms as informal institutions is relatively slow compared to formal institutions, policymakers must produce planned policies to increase the impact of these norms in developing economies.

Thirdly, in Model 3 for developed countries, where we examined the effects of regulatory institutions, we found that entrepreneurial finance, government policy support and relevance and government policy taxes and bureaucracy positively affect early entrepreneurship. In this regard, our results contribute to the mixed findings of past research (Hechavarría and Ingram, 2019; Sá and De Pinho, 2019; Cervelló-Royo *et al.*, 2020; Charfeddine and Zaouali, 2022; De Mello *et al.*, 2022). Our analysis results partially support the H3a and H3b hypotheses. On the other hand, R&D transfers negatively impact early entrepreneurship. Studies suggest that R&D transfers positively influence TEA (Total Early-stage Entrepreneurial Activity) (Amorós *et al.*, 2019b; Sá and De Pinho, 2019). However, contrary to the prevailing trends in the literature, our results indicate that increases in R&D transfers have a negative impact on TEA. One potential explanation for this result is the issues experienced in entrepreneurial activity. Research demonstrates that academic startups may face problems in R&D transfer and knowledge diffusion due to a lack of organizational capabilities that influence growth and sustainability (Visintin and Pittino, 2014). Nevertheless, other non-academic startups may possess stronger organizational capabilities but have less access to R&D resources (Sá and De Pinho, 2019). Furthermore, academic and non-academic new firms may not adequately internalize the information accompanying R&D transfer due to their limited internal absorptive capacity (Cohen and Levinthal, 1990). However, the obstacles new firms face when acquiring new information from outside sources (Wynarczyk, 2013), limited resources (knowledge, social networks, finance, etc.), small size and newness liability (Bruderl and Schussler, 1990; DeTienne, 2010; Guerrero *et al.*, 2021) are likely to adversely affect entrepreneurial activities. Additionally, policies formulated by policymakers without considering TEA's mindset, behaviors and skills may have also influenced this process (Williams and Huggins, 2013).

In Model 3 in developing countries, we concluded that commercial and legal infrastructure has a negative impact on TEA out of 11 variables. In this respect, our findings for developing countries support the results of previous studies (Guerrero *et al.*, 2021; Hechavarría and Ingram, 2019; Davis and Williamson, 2016; Kuckertz *et al.*, 2016). A possible explanation for this result is that despite the positive commercial and legal infrastructure regulations in developing economies, entrepreneurs have difficulties reaching these regulations due to bureaucratic obstacles (Hechavarría and Ingram, 2019). Moreover, in these countries, problems arising from the unstable financial system and insufficient-weak institutions (Junaid *et al.*, 2022; Patel and Wolfe, 2022; Wales *et al.*, 2021), high transaction costs (Audretsch *et al.*, 2022a, b), the complexity of trade-related legal regulations (Weng *et al.*, 2021), unfriendly bankruptcy laws (Hechavarría and Ingram, 2019; Lee *et al.*, 2011) are likely to slow entrepreneurial activity. Commercial regulations, lengthy bureaucratic processes, restrictions on access to credit and insufficient knowledge of entrepreneurs on legal and commercial infrastructure may have contributed to this negative effect. For this reason, it is important for future research to focus on which factors in the commercial and legal infrastructure have negative effects. Entry regulation positively affects early entrepreneurship in developing countries. In this context, our analysis results support the results of previous studies (Klapper *et al.*, 2006; Estrin *et al.*, 2013) and reveal the importance of industry entry regulations for developing economies. An institutional environment with

simple administrative procedures, low entry regulations for market entry, tax breaks, exemption of wages and transaction costs, support for staff to be employed and labor regulations make it easier for entrepreneurs (Grilli *et al.*, 2023). In this respect, our initial estimations support our results, and we see that different regulatory institutions impact TEA in developed and developing countries. Therefore, according to these results, H3 was partially supported.

Fourthly, the results of Model 4, which were constructed to determine the effect of macroeconomic indicators on early entrepreneurship, reveal that the variables of current account balance and consumer price index are statistically significant in developed countries. We found that a one-point increase in the current account deficit variable for developed countries (i.e. a one-point decrease in the ratio of the current account deficit to GDP) positively affects TEA. Our results corroborate the findings of previous studies (Hessels and Van Stel, 2011; Adrangi vd., 2002). However, Liargovas *et al.* (2022), we reach different results according to the research. One reason may be that Liargovas' (2022)'s research was limited to only countries such as Portugal, Greece, Spain and Italy. Moreover, even the authors have determined that there are differences between these countries in the relationship between current account balance and entrepreneurship. Therefore, it can be said that sample differences are effective in reaching different analysis results. Although this result seems illogical, invalidating H4c, the relationship between current account balance and TEA can be explained by Rostow's theorem of stages of economic development. This theory states that developed countries in the fourth and especially in the fifth stage allocate their resources to minimum expenditures and include other countries in their economic and political spheres of influence; thus, they can maintain high current account deficits (Hidalgo, 2023; Willis, 2023; Rostow, 1960).. It is thought that countries reaching the stage of mass consumption (fifth stage) may have contributed to the development of the early entrepreneurial class, particularly as they gravitate towards advanced technology and R&D-intensive goods. Other macroeconomic indicators did not exhibit a significant effect on developed countries. In these countries, where market breadth is ensured and industrialization has matured, new entrepreneurs are not expected to emerge in every sector. New entrepreneurs must pivot towards more complex, technology-intensive products to carve out a market niche in these countries. This process is inherently more challenging and attenuates the direct relationship between new entrepreneurial activities and economic variables. Furthermore, we deduced that an increase in the consumer price index also positively influences early entrepreneurship. Even though rising consumer prices indicate price instability, they signal that the demand for final goods in developed countries is robust. It is plausible that this excess demand incentivizes entrepreneurs to create new products. Moreover, the prospect of high profits fueled by price hikes during inflationary periods supports entrepreneurial activities. In this respect, we contribute to the mixed results of previous studies (Amorós *et al.*, 2016; Charfeddine and Zaouali, 2022; Léon, 2019).

Model 4, designed to assess the effect of macroeconomic indicators on early entrepreneurship in developing countries, revealed the impact of eight variables. This is substantially more than in developed countries and lends credence to H4a. Our findings show that economic growth (Castaño *et al.*, 2015; Gaies and Maalaoui, 2022), GDP per capita (Carree *et al.*, 2007; Valliere and Peterson, 2009) and total exports (Castaño *et al.*, 2015; Hessels and Van Stel, 2011) exert a positive influence on early entrepreneurship. The positive coefficients of these three variables, which contribute to economic stability, are theoretically expected and support H4b. Moreover, our findings corroborate the results of previous studies (Crudu, 2019; Marques, 2019; Amorós *et al.*, 2019a; Charfeddine and Zaouali, 2022). As the economy develops, the entrepreneurial class evolves in tandem. Conversely, the impact of variables signifying economic instability on early entrepreneurship in developing countries is more intricate. This is because specific economic imbalances may generate new opportunities for

entrepreneurial sectors. For instance, an uptick in inflation (as measured by the consumer price index) and the ratio of the current account deficit to GDP positively influenced early-stage entrepreneurship in developing countries. One possible explanation for this seemingly counterintuitive relationship could be the relative price advantage caused by inflation in developing countries, which could be attributed to the increased revenue from export-driven growth and challenges associated with importing products into the country (Dvouletý and Orel, 2019). Robust aggregate demand bolsters entrepreneurial activities in developing countries, mirroring the scenario in developed countries. An increase in the current account deficit as a share of GDP indicates that imported inputs finance the industry in developing countries. While the industrialization process in developing countries occurs at the cost of a widening current account deficit, it also facilitates the growth of early-stage entrepreneurs.

Furthermore, increases in the gross debt stock, total imports, and the unemployment rate negatively impact early-stage entrepreneurship. These variables – debt stock, imports and the unemployment rate – indicate economic instability (Mahadea and Kabange, 2022). These results suggest that escalations in the debt stock, import rates and unemployment rate reduce entrepreneurial motivation and create hurdles to the emergence of a new entrepreneurial class. This deviates from the findings of previous studies (Charfeddine and Zaouali, 2022; Ragmoun, 2023). The differences in our results compared to these studies could stem from the time ranges of longitudinal data, differences in the countries included in the sample and the inclusion of different variables in the analysis. For example, Charfeddine and Zaouali (2022) conducted a panel data analysis for 2001–2018. A similar situation exists in Ragmoun's (2023) research, which involves a panel data analysis for 1996–2019. In this study, Ragmoun (2023) worked on a sample from 24 developed countries and found a significant and positive impact only for four years between unemployment rates and entrepreneurial activities. Therefore, this discrepancy could be due to the changing effects of longitudinal data over the years. The results from Model 4 present a dichotomy, particularly for developing countries. In such nations, economic stability bolsters early entrepreneurship positively (growth, per capita income and exports). However, these countries' economic instabilities (debt stock, imports and unemployment rate) appear to negatively influence early entrepreneurship while simultaneously providing an avenue for the entrepreneurial sector to convert crises (inflation and current account deficit) into opportunities. These findings partially corroborate H4c. Nevertheless, a striking result is the lack of impact of gross national savings rates on TEA in both developed and developing countries, which contradicts previous studies asserting that gross national savings rates promote economic development (Medeiros *et al.*, 2020). One possible explanation for this situation could be related to how countries allocate their savings to different resources and investments. For instance, some emerging economies are still focusing on infrastructure investments. Similarly, in developed countries, the savings rate may have been channeled into credit opportunities for large and innovative firms. Additionally, the inadequacy of countries' savings rates could also have influenced this situation. While this result motivates future research, it also serves as a cautionary note for policymakers.

5.2 Policy and managerial implications

The results of our study offer some managerial and policy implications. Firstly, the findings related to institutions indicate that the impact of institutions is more significant in developed countries than in developing countries. These results demonstrate that the effects of institutions on early-stage entrepreneurship vary depending on a country's stage of economic development, with a more pronounced impact in advanced "innovation-driven" economies compared to "efficiency-driven" economies (Stenholm *et al.*, 2013; Wales *et al.*, 2021). Policymakers in developing economies can focus on the effects of cognitive-cultural

institutions to support early-stage entrepreneurial activities and establish a favorable entrepreneurial ecosystem. The analysis results highlight the influence of entrepreneurship education in developed countries. Accordingly, policymakers in developing economies can develop policies aimed at entrepreneurship education during and after schooling to enhance individuals' entrepreneurial intentions and capabilities and improve the entrepreneurial ecosystem by leveraging perceived opportunities for starting ventures (Nabi *et al.*, 2018; Guerrero *et al.*, 2021).

Secondly, another finding is that cultural and social norms in developed countries tend to encourage early-stage entrepreneurship more than in developing countries. Entrepreneurship rates increase when entrepreneurial activities are aligned with the culture, values and appropriateness norms of society, and these results are supported by previous cross-cultural research (Bağış *et al.*, 2023b; Wales *et al.*, 2021; Saeed *et al.*, 2014). We suggest policymakers in developing countries create societal norms that promote entrepreneurship. In this regard, policymakers should develop policies to construct a cultural framework that perceives entrepreneurship as a desirable behavior in society. It is a fact that the conversion of these institutional elements into cultural changes affecting entrepreneurial behavior takes a long time (Autio *et al.*, 2013). The capacity of top-down management policies to shape normative and cognitive dimensions is limited, at least in the short term (Acs *et al.*, 2008; De Mello *et al.*, 2022). However, such policies are still necessary for establishing a given entrepreneurial ecosystem.

Thirdly, our results indicate a stronger relationship between institutional regulations and entrepreneurial activity in developed countries than in developing economies (Stenholm *et al.*, 2013; De Mello *et al.*, 2022). Therefore, we recommend that policy makers, especially for developing economies, create supportive and quality institutions if they aim to increase the pace of entrepreneurial activity in their countries. Given that the extent of institutional effectiveness varies with different stages of the entrepreneurial process (Junaid *et al.*, 2022), policymakers can create an ecosystem in which early-stage entrepreneurs can enter and exit the market quickly, with low entry and exit costs and simply. In addition, these entrepreneurs can develop their basic business skills with training and consultancy support. The content of these trainings may be the development of organizational routines and capabilities, the advantages of inter-firm alliances and the development of internationalization and export activities (Mukherjee *et al.*, 2021). In this way, the problems experienced by new enterprises due to liability newness are eliminated, and they can ensure their sustainability (Evansluong *et al.*, 2023). In this respect, our findings provide arguments for policymakers to design public policies and institutions that support economic development policies.

Fourthly, we have found that entrepreneurial finance significantly impacts early-stage entrepreneurial activities in developed economies, while it has little to no effect in developing economies. In this context, it should be emphasized that financial support targeted at early-stage entrepreneurship plays a crucial role in the growth and sustainability of new ventures in developing economies. For instance, policymakers should implement reforms to remove financial barriers that impede access to credit for new entrepreneurs (Ragmoun, 2023; Charfeddine and Zaouali, 2022). Policymakers could enact regulations to facilitate new ventures' access to financial technologies. Furthermore, financial accessibility is directly linked to macroeconomic indicators such as low-interest rates, monetary policy, gross debt stock, low-interest loans and savings rates in developing countries. Therefore, policymakers should establish stable and predictable macroeconomic policies to provide suitable financing opportunities for new entrepreneurs.

Fifthly, we have found that government support, policies, tax rates and bureaucracy are more effective in developed countries. These findings provide essential signals for policymakers in developing economies. We recommend that in developing countries,

government support and policies should be structured in a way that positively affects the competitiveness and profitability of new entrepreneurs (Teixeira *et al.*, 2018). Furthermore, support and policies should not create high tax burdens for new entrepreneurs (Nascimento and Mattos, 2023) and subsidies should be evenly distributed among new entrepreneurs across different industries. Additionally, we advise the establishment of import quotas in developing countries to promote domestic production and recommend increasing customs duties against imported goods (Teixeira *et al.*, 2018; Hechavarría and Ingram, 2019). An intriguing finding was that the effects of R&D transfers on early-stage entrepreneurs in developed countries tend to be negative. This situation could be influenced by factors such as the lack of new organizational capabilities among early-stage entrepreneurs, as well as an absence of skills in internalizing and assimilating new information. Therefore, we recommend that policymakers formulate a set of guiding principles to enhance the positive impacts of R&D transfers, specifically targeted towards early-stage entrepreneurs.

Finally, we recommend that governments continuously review the conditions and supportive policies that can be influenced by macroeconomic policies and fluctuations affecting entrepreneurial activities, particularly in developing economies (Charfeddine and Zaouali, 2022; Castaño *et al.*, 2015). Therefore, policymakers should generate policies that promote entrepreneurship and ensure macroeconomic stability. It is well known that monetary policies, inflation, low-interest rates and countries' savings rates create a secure macroeconomic environment that fosters growth and provides a safer environment for private sector investment decisions. Studies indicate that good macroeconomic management leads to faster growth for a given investment rate (Bleaney, 1996; Petrini and Teixeira, 2023; Bianchi *et al.*, 2023). Therefore, policymakers in developing economies can contribute to the revitalization of the entrepreneurial ecosystem and the longevity of early-stage entrepreneurs in the economy by creating a predictable, transparent, secure and rules-based investment environment in terms of macroeconomic indicators.

5.3 Limitations and future research

The limitations of our research and recommendations for future research can be grouped under several headings. Firstly, there are limitations due to the data we used. Our dataset shows that the number of developed economies is higher than that of developing economies (Mickiewicz *et al.*, 2021; Bjørnskov and Foss, 2016). Although GEM and IMF have provided consistent data on entrepreneurship for many countries and years, future research needs to conduct longitudinal and comparative analyses covering a broader range of years and countries. However, it is important to note that no comprehensive and detailed database covers all countries. Therefore, we recommend that future research combines different databases to identify variables that affect entrepreneurial activity. Secondly, the distribution of data for some countries in the GEM by year is irregular. As a result, the datasets of countries do not consistently appear across all surveys for various reasons, and we encountered limitations in conducting longitudinal analysis (Junaid *et al.*, 2022). Therefore, future studies can be designed to cover more years and include different variables. Thirdly, we cannot infer which policy decisions in a country affect specific institutions and macroeconomic indicators. This limitation calls for future research to examine the impact of policymakers' decisions on institutions, macroeconomic developments and their reflections on TEA (Beynon *et al.*, 2020). Finally, our analysis of factors affecting TEA remained at the national level. Therefore, we were unable to examine factors within a country in depth. In this context, we think that the accuracy of our findings may vary depending on the level of economic prosperity of a country. Future studies may consider conducting in-depth analyses in one or more countries to generate comparative results (Hechavarría and Ingram, 2019).

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Variables	Coef	Std. Err	t	$p > t$	[95% conf. Interval]		Coef	Std. Err	t	$p > t$	[95% conf. Interval]	
					Developed country results							
Model 1 fixed effects (valid model)												
PSO	0.03547	0.010913	3.25	0.001	0.013967	0.056974	0.035051	0.01061	3.3	0.001	0.014256	0.055846
PC	−0.01186	0.025898	0.46	0.648	−0.06289	0.039178	0.028192	0.022678	1.24	0.214	−0.01626	0.07264
FoF	0.039156	0.021208	1.85	0.066	−0.00263	0.080947	0.03792	0.020434	1.86	0.063	−0.00213	0.07797
EI	0.247946	0.026594	9.32	0	0.195542	0.30035	0.268827	0.024017	11.19	0.000	0.221756	0.315899
EEA	0.132408	0.058842	2.25	0.025	0.016459	0.248357	0.096062	0.057227	1.68	0.093	−0.0161	0.208225
EMI	0.003492	0.044002	0.08	0.937	−0.08321	0.090198	−0.00517	0.04398	−0.12	0.906	−0.09137	0.081025
EES	0.059213	0.4563	0.13	0.897	−0.83993	0.95836	0.034293	0.434459	0.08	0.937	−0.81723	0.885818
EEPS	1.110672	0.477248	2.33	0.021	0.170247	2.051098	1.125523	0.463662	2.43	0.015	0.216762	2.034283
_cons	−1.19834	1.993128	0.6	0.548	−5.12583	2.729151	−2.92795	1.922673	−1.52	0.128	−6.69632	0.84042
F(8,226)					*21.19 (0.000)*		*Wald χ^2(8)*				*228.31 (0.0000)*	
R2					*0.4286*		*R2*				*0.4193*	
rho					*0.78805585*		*rho*				*0.68146424*	
Hausman χ^2(8)							*60.31 (0.0000)*					
Modified Wald test (heteroskedasticity)							*2840.39 (0.0000)*					
Serial Correlation Test F(25,200)							*10.08 (0.0000)*					
Model 2 fixed effects (valid model)												
HSSE	0.015681	0.071199	0.22	0.827	−0.13067	0.162033	−0.01078	0.061313	0.18	0.86	−0.13095	0.109392
EGCC	−0.08626	0.045781	1.88	0.071	−0.18036	0.007845	−0.05756	0.033868	1.7	0.089	−0.12394	0.008818
CSN	1.043101	0.326132	3.2	0.004	0.372727	1.713475	1.08464	0.311323	3.48	0	0.474458	1.694821
_cons	7.641556	4.689877	1.63	0.115	−1.99862	17.28174	7.542172	4.531173	1.66	0.096	−1.33876	16.42311
R2					*0.1149*		*R2*				*0.1102*	
F(3.26)					*4,62 (0.0102)*		*Wald χ^2(11)*				*14.23 (0.0026)*	
rho					*0.87122*		*rho*				*0.8375*	
Hausman χ^2(8)							*3.22 (0.3582)*					
Lovene Brown df(26,243) (heteroskedasticity)							*Pr > F = 0.00000000*					
Serial Correlation Test Baltagi-Wu LBI							*1.3175158*					
Model 3 fixed effects (valid model)												
EF	2.010409	0.461008	4.36	0	1.102152	2.918666	1.901635	0.471527	4.03	0	0.977459	2.825812
GPRS	0.518457	0.297251	1.74	0.082	−0.06717	1.104086	0.507787	0.303144	1.68	0.094	−0.08636	1.101938
GPTB	1.341001	0.339641	3.95	0	0.671856	2.010146	1.406884	0.340005	4.14	0	0.740487	2.073282

(*continued*)

Table A1.
FEM and REM selection (developed country results)

Table A1.

Developed country results												
Variables	Coef	Std. Err	t	$p > t$	[95% conf. Interval)		Coef	Std. Err	t	$p > t$	[95% conf. Interval)	
GEP	1.045008	0.680493	1.54	0.126	−0.29567	2.385685	0.940767	0.664833	1.42	0.157	−0.36228	2.243816
RDT	−2.00559	0.775786	−2.59	0.01	−3.53401	−0.47717	−2.46872	0.772678	−3.2	0.001	−3.98315	−0.9543
CLI	1.671274	0.682121	2.45	0.015	0.327391	3.015157	1.464715	0.676798	2.16	0.03	0.138215	2.791214
IMD	0.240835	0.439746	0.55	0.584	−0.62553	1.107201	−0.06901	0.434353	−0.16	0.874	−0.92033	0.782305
EEBR	−1.03409	0.731506	−1.41	0.159	−2.47527	0.40709	−0.86	0.730182	−1.18	0.239	−2.29113	0.571129
FI	−0.22245	0.453982	−0.49	0.625	−1.11687	0.671963	−0.05633	0.458598	−0.12	0.902	−0.95517	0.842506
_cons	−1.55017	2.847897	−0.54	0.587	−7.16096	4.060627	0.511329	2.892224	0.18	0.86	−5.15733	6.179984
R2					*0.1813*		*R2*				*0.1762*	
F(9,234)					*5.76 (0.0000)*		*Wald χ^2(11)*				*48.46 (0.0000)*	
rho					*0.8457*		*rho*				*0.7494*	
Hausman χ^2(8)							*49.36 (0.0000)*					
Modified Wald test (heteroskedasticity)							*2517.71 (0.000)*					
Serial Correlation Test F(26,207)							*13.76 (0.0000)*					
Model 4 fixed effects								*Model 4 random effects (valid model)*				
GR	0.067669	0.050089	1.35	0.178	−0.03111	0.166452	0.064835	0.050576	1.28	0.200	−0.03429	0.163962
GDPPC	3.09E-06	7.48E-07	4.14	0.000	1.62E-06	4.57E-06	1.55E-06	3.51E-07	4.43	0.000	8.67E-07	2.24E-06
TE	−0.00366	0.026015	−0.14	0.888	−0.05496	0.047646	−0.00404	0.026137	−0.15	0.877	−0.05527	0.047185
CAB	0.003781	0.003583	1.06	0.293	−0.00329	0.010847	0.005996	0.003129	1.92	0.055	−0.00014	0.012128
GDS	3.28E-06	4.01E-06	0.82	0.415	−4.63E-06	1.12E-05	−1.78E-06	2.86E-06	−0.62	0.535	−7.39E-06	3.84E-06
TI	0.022968	0.023186	0.99	0.323	−0.02276	0.068695	0.022355	0.02331	0.96	0.338	−0.02333	0.068042
UR	−0.06977	0.053567	−1.3	0.194	−0.17541	0.035875	−0.09493	0.051808	−1.83	0.067	−0.19647	0.006612
CPI	0.035462	0.025518	1.39	0.166	−0.01486	0.085788	0.090915	0.018078	5.03	0.000	0.055482	0.126348
GNS	−0.04141	0.049397	−0.84	0.403	−0.13883	0.056011	−0.05759	0.047647	−1.21	0.227	−0.15098	0.035791
DIE	−0.03886	0.056543	−0.69	0.493	−0.15037	0.07265	−0.00959	0.055488	−0.17	0.863	−0.11835	0.099162
POP	0.22506	0.085144	2.64	0.009	0.057145	0.392976	−0.01585	0.014738	−1.08	0.282	−0.04473	0.013037
_cons	−5.8364	3.370315	−1.73	0.085	−12.4831	0.810337	−0.3092	2.505381	−0.12	0.902	−5.21966	4.601254
R2					*0.3404*		*R2*				*0.2986*	
F(11,196)					*9.19 (0.0000)*		*Wald χ^2(11)*				*92.65 (0.0000)*	
rho					*0.9936*		*rho*				*0.8857*	
Hausman χ^2(8)							*11.93 (0.2174)*					
Lovene Brown df(22,207) (heteroskedasticity)							*Pr > F= 0.00000001*					
Serial Correlation Test Baltagi-Wu LBI							*1.3293556*					

Source(s): Created by authors

Table A2. FEM and REM selection (developing country results)

Developed country results												
Variables	Coef	Std. Err	t	$p > t$	[95% conf. Interval)		Coef	Std. Err	t	$p > t$	[95% conf. Interval)	
Model 1 fixed effects (valid model)									*Model 1 random effects*			
PSO	0.03547	0.010913	3.25	0.001	0.013967	0.056974	0.035051	0.01061	3.3	0.001	0.014256	0.055846
PC	−0.01186	0.025898	0.46	0.648	−0.06289	0.039178	0.028192	0.022678	1.24	0.214	−0.01626	0.07264
FoF	0.039156	0.021208	1.85	0.066	−0.00263	0.080947	0.03792	0.020434	1.86	0.063	−0.00213	0.07797
EI	0.247946	0.026594	9.32	0	0.195542	0.30035	0.268827	0.024017	11.19	0.000	0.221756	0.315899
EEA	0.132408	0.058842	2.25	0.025	0.016459	0.248357	0.096062	0.057227	1.68	0.093	−0.0161	0.208225
EMI	0.003492	0.044002	0.08	0.937	−0.08321	0.090198	−0.00517	0.04398	−0.12	0.906	−0.09137	0.081025
EES	0.059213	0.4563	0.13	0.897	−0.83993	0.95836	0.034293	0.434459	0.08	0.937	−0.81723	0.885818
EEPS	1.110672	0.477248	2.33	0.021	0.170247	2.051098	1.125523	0.463662	2.43	0.015	0.216762	2.034283
_cons	−1.19834	1.993128	0.6	0.548	−5.12583	2.729151	−2.92795	1.922673	−1.52	0.128	−6.69632	0.84042
F(8,226)					*21.19 (0.000)*		*Wald χ^2(8)*				*228.31 (0.0000)*	
R2					*0.4286*		*R2*				*0.4193*	
rho					*0.78805585*		*rho*				*0.68146424*	
Hausman χ^2(8)							*60.31 (0.0000)*					
Modified Wald test (heteroskedasticity)							*2840.39 (0.0000)*					
Serial Correlation Test F(25,200)							*10.08 (0.0000)*					
Model 2 Fixed Effects (Valid Model)									*Model 2 Random Effects*			
HSSE	0.04742	0.072036	0.66	0.512	−0.09509	0.189935	0.025545	0.067437	0.38	0.705	−0.10663	0.157719
EGCC	0.092965	0.055572	1.67	0.097	−0.01698	0.202908	0.09966	0.051622	1.93	0.054	−0.00152	0.200837
CSN	0.437387	0.877946	0.5	0.619	−1.29952	2.174299	1.061885	0.804696	1.32	0.187	−0.51529	2.63906
_cons	1.192331	5.919772	0.2	0.841	−10.5192	12.90389	1.606676	5.613132	0.29	0.775	−9.39486	12.60821
R2					*0.1149*		*R2*				*0.1102*	
F(3.26)					1.86 (0.0445)		Wald χ^2(11)				9.63 (0.022)	
rho					*0.70407*		*rho*				*0.8375*	
Hausman χ^2(3)							*23.71 (0.0000)*					
Lovene Brown df(26,243) (heteroskedasticity)							*Pr > F = 0.00000000*					
Serial Correlation Test Baltagi-Wu LBI							*1.41097*					
Model 3 Fixed Effects (Valid Model)									*Model 3 Random Effects*			
EF	−1.79977	1.673529	−1.08	0.284	−5.10763	1.508085	−2.01849	1.607056	−1.26	0.209	−5.16826	1.131281
GPRS	−2.47283	1.370184	−1.8	0.073	−5.1811	0.235442	−2.41898	1.334082	−1.81	0.07	−5.03373	0.195776
GPTB	−1.00162	1.810065	−0.55	0.581	−4.57935	2.57611	−1.05466	1.661595	−0.63	0.526	−4.31132	2.202009

(*continued*)

Table A2.

	Developed country results											
Variables	Coef	Std. Err	t	$p > t$	[95% conf. Interval)		Coef	Std. Err	t	$p > t$	[95% conf. Interval)	
GEP	−0.60304	2.182063	−0.28	0.783	−4.91605	3.709973	−0.32464	2.059569	−0.16	0.875	−4.36132	3.712044
RDT	1.339462	2.608991	0.51	0.608	−3.81741	6.49633	1.124083	2.462293	0.46	0.648	−3.70192	5.950088
CLI	−3.72767	1.771643	−2.1	0.037	−7.22946	−0.22589	−3.95393	1.677161	−2.36	0.018	−7.24111	−0.66676
IMD	0.267943	1.309837	0.2	0.838	−2.32105	2.856933	−0.2809	1.243659	−0.23	0.821	−2.71843	2.156626
EEBR	3.564322	2.040022	1.75	0.083	−0.46793	7.596579	4.083348	1.992142	2.05	0.04	0.178821	7.987874
FI	1.389653	1.398127	0.99	0.322	−1.37385	4.153156	1.72591	1.343125	1.28	0.199	−0.90657	4.358388
_cons	22.15161	7.298486	3.04	0.003	7.725608	36.57762	22.33185	6.828933	3.27	0.001	8.947385	35.71631
R2					*0.12.45*		*R2*				*0.1218*	
F(9,144)					*2.30 (0.0126)*		*Wald χ^2(9)*				*23.93 (0.0044)*	
rho					*0.70556*		*rho*				*0.69645*	
Hausman χ^2(8)							*5.01 (0.9308)*					
Lovene Brown df(16,42) (heteroskedasticity)							*Pr > F = 0.00036*					
Serial Correlation Test Baltagi-Wu LBI							*1.5606022*					
Model 4 Fixed Effects							*Model 4 Random Effects (Valid Model)*					
GR	0.067669	0.050089	1.35	0.178	−0.03111	0.166452	0.064835	0.050576	1.28	0.200	−0.03429	0.163962
GDPPC	3.09E-06	7.48E-07	4.14	0.000	1.62E-06	4.57E-06	1.55E-06	3.51E-07	4.43	0.000	8.67E-07	2.24E-06
TE	−0.00366	0.026015	−0.14	0.888	−0.05496	0.047646	−0.00404	0.026137	−0.15	0.877	−0.05527	0.047185
CAB	0.003781	0.003583	1.06	0.293	−0.00329	0.010847	0.005996	0.003129	1.92	0.055	−0.00014	0.012128
GDS	3.28E-06	4.01E-06	0.82	0.415	−4.63E-06	1.12E-05	−1.78E-06	2.86E-06	−0.62	0.535	−7.39E-06	3.84E-06
TI	0.022968	0.023186	0.99	0.323	−0.02276	0.068695	0.022355	0.02331	0.96	0.338	−0.02333	0.068042
UR	−0.06977	0.053567	−1.3	0.194	−0.17541	0.035875	−0.09493	0.051808	−1.83	0.067	−0.19647	0.006612
CPI	0.035462	0.025518	1.39	0.166	−0.01486	0.085788	0.090915	0.018078	5.03	0.000	0.055482	0.126348
GNS	−0.04141	0.049397	−0.84	0.403	−0.13883	0.056011	−0.05759	0.047647	−1.21	0.227	−0.15098	0.035791
DIE	−0.03886	0.056543	−0.69	0.493	−0.15037	0.07265	−0.00959	0.055488	−0.17	0.863	−0.11835	0.099162
POP	0.22506	0.085144	2.64	0.009	0.057145	0.392976	−0.01585	0.014738	−1.08	0.282	−0.04473	0.013037
_cons	−5.8364	3.370315	−1.73	0.085	−12.4831	0.810337	−0.3092	2.505381	−0.12	0.902	−5.21966	4.601254
R2					*0.3404*		*R2*				*0.2986*	
F(11,196)					*9.19 (0.0000)*		*Wald χ^2(11)*				*92.65 (0.0000)*	
rho					*0.9936*		*rho*				*0.8857*	
Hausman χ^2(8)							*11.93 (0.2174)*					
Lovene Brown df(22,207) (heteroskedasticity)							*Pr > F = 0.00000001*					
Serial Correlation Test Baltagi-Wu LBI							*1.3293556*					

Source(s): Created by authors

Table A3.
Descriptive statistics

Developed country sample						Developing country sample					
Variables	Obs	Mean	Std. Dev	Min	Max	Variable	Obs	Mean	Std. Dev	Min	Max
TEA	260	8.368737	4.203251	2.35	26.83	TEA	160	15.304	6.917539	2.93	35.97
PSO	260	35.49767	16.95061	2.85	81.56	PSO	160	43.18425	12.05149	13.8	73.06
PC	260	42.76042	11.43358	9	73.3	PC	160	51.64235	14.01182	22.69	76.79
FoF	260	37.85967	7.913868	22.12	64.83	FoF	160	33.89756	8.775737	14	65.32
EI	260	13.83844	9.161118	2.49	50.14	EI	160	25.21377	14.0212	2.12	59.65
EEA	260	4.742968	2.553689	0.76	16.18	EEA	160	1.360314	1.153596	0.15	5.05
EMI	260	3.396622	2.87551	−0.33	20.72	EMI	160	2.045208	1.467329	0.54	9.22
EES	260	2.017503	0.3889211	1.28	3.43	EES	160	1.917792	0.2998434	1.3	2.56
EEPS	260	2.828865	0.3383427	2.05	3.9	EEPS	160	2.881562	0.3481136	1.83	3.75
HSSE	189	67.23719	9.958937	2.35	88.32	HSSE	160	69.84919	9.304221	44.98	86.33
EGCC	189	58.85048	11.43771	22.8	87.41	EGCC	160	69.40515	11.82359	39.26	95.62
CSN	189	4.563685	0.952562	2.7	7.33	CSN	160	4.749438	0.627784	3.13	6.03
EF	270	2.643654	0.3855484	1.65	4.21	EF	170	2.36698	0.4285051	1.553333	3.58
GPRS	270	2.666722	0.6320857	1.5	7.98	GPRS	170	2.445451	0.4419257	1.48	3.79
GPTB	270	2.430426	0.5891087	−1.73	3.7	GPTB	170	2.155539	0.4346863	1.28	3.32
GEP	270	2.791327	0.4381972	1.72	3.793333	GEP	170	2.39048	0.424542	1.34	3.41
RDT	270	2.542352	0.3519334	1.828333	3.73	RDT	170	2.198873	0.3023271	1.57	3.11
CLI	270	3.100321	0.3600306	2.12	3.89	CLI	170	2.827667	0.3137833	1.26	3.48
IMD	270	2.963772	0.5447183	1.78	4.446667	IMD	170	3.067853	0.5284619	1.84	4.35
EEBR	270	2.667185	0.3372573	1.71	3.73	EEBR	170	2.382961	0.3022159	1.29	3.13
FI	270	3.956179	0.3961394	2.1	4.84	fa	170	3.613088	0.3708023	2.676667	4.44
GR	230	1.241	3.402231	−14.26	25.305	GR	170	3.365676	3.588003	−7.821	12.111
GDPPC	230	998533.2	2,101,312	9702.43	8,034,643	GDPPC	170	988117.7	3,633,155	3701.72	1.69e+07
TE	230	2.938813	6.858182	−23.383	38.212	TE	170	3.495135	6.913819	−17.024	28.461
CAB	230	−1.669278	115.8257	−696.523	295.118	CAB	170	9.613306	65.13922	−101.431	420.569
GDS	230	52975.34	232498.4	4.392	1,279,900	GDS	170	20020.21	71871.71	7.716	455046.9
TI	230	2.559861	7.913437	−30.894	32.303	TI	170	4.366129	11.22069	−32.649	39.414
UR	230	8.787678	4.889743	2.41	27.475	UR	170	8.728012	6.960416	0.655	28
CPI	230	106.2855	30.54003	67.149	245.136	CPI	170	1.44e+12	5.89e+12	49.872	3.19e+13
GNS	230	22.3244	6.816312	3.882	41.582	GNS	170	22.96892	9.025929	6.106	51.613
DIE	230	21.59043	3.79385	11.903	37.461	DIE	170	24.76339	7.635742	13.529	47.029
POP	230	40.07898	66.71631	1.969	325.143	POP	170	130.8528	312.2384	2.677	1390.08

Source(s): Created by authors

	Level Z[t-bar]	First difference Z [t-bar]	Level Z[t-bar]	First difference Z[t-bar]
	Model 1 (developed countries)		*Model 1 (developing countries)*	
TEA	−1.382 (0.083)	−1.591 (0.056)	−0.224 (0.412)	−2.591 (0.005)
POS	−2.871 (0.002)	−1.584 (0.057)	−2.869 (0.002)	−2.424 (0.008)
PC	−1.127 (0.130)	−3.696 (0.000)	−1.009 (0.157)	−0.313 (0.377)
FoF	−1.900 (0.029)	−4.797 (0.000)	−1.471 (0.071)	0.157 (0.562)
EI	−3.432 (0.000)	−4.307 (0.000)	−2.890 (0.002)	−2.982 (0.001)
EEA	1.171 (0.879)	−1.539 (0.062)	0.127 (0.551)	1.604 (0.946)
EMI	0.113 (0.545)	−2.595 (0.005)	−0.437 (0.331)	−2.077 (0.019)
EES	−1.299 (0.097)	−3.055 (0.001)	0.0641 (0.524)	−1.061 (0.144)
EEPS	1.675 (0.950)	−0.877 (0.190)	−1.627 (0.052)	−2.481 (0.007)
	Model 2 (developed countries)		*Model 2 (developing countries)*	
TEA	−1.882 (0.030)	−0.773 (0.220)	−0.851 (0.197)	−3.244 (0.001)
HSSE	−1.358 (0.087)	−1.370 (0.085)	1.035 (0.850)	−2.464 (0.007)
EGCC	−1.170 (0.121)	−1.311 (0.095)	−1.022 (0.153)	−0.382 (0.351)
CSN	−0.505 (0.693)	−5.488 (0.000)	0.411 (0.659)	−1.970 (0.024)
	Model 3 (developed countries)		*Model 3 (developing countries)*	
TEA	−0.487 (0.313)	−3.921 (0.000)	−0.249 (0.402)	−0.950 (0.171)
EF	0.328 (0.628)	0.473 (0.662)	2.251 (0.988)	−0.179 (0.429)
GPRS	−2.199 (0.014)	−0.719 (0.236)	−0.831 (0.203)	−0.951 (0.171)
GPTB	−0.305 (0.380)	2.495 (0.944)	−0.322 (0.374)	−1.306 (0.096)
GEP	1.376 (0.916)	−2.029 (0.021)	0.488 (0.687)	−1.936 (0.026)
RDT	−2.510 (0.006)	−3.828 (0.000)	−1.029 (0.152)	−2.710 (0.003)
CLI	1.034 (0.845)	−6.433 (0.000)	−1.746 (0.040)	−2.783 (0.003)
IMD	−0.581 (0.281)	−3.865 (0.000)	−0.155 (0.483)	−0.524 (0.300)
EEBR	−0.662 (0.254)	−4.459 (0.000)	0.040 (0.516)	−1.970 (0.024)
FI	−1.190 (0.117)	−1.286 (0.099)	−2.591 (0.005)	−4.368 (0.000)
	Model 4 (developed countries)		*Model 4 (developing countries)*	
TEA	−1.358 (0.087)	−4.093 (0.000)	−0.331 (0.370)	−4.052 (0.000)
GR	−3.978 (0.000)	−3.692 (0.000)	1.259 (0.896)	−2.232 (0.013)
GDPPC	−1.673 (0.047)	−6.715 (0.000)	1.227 (0.890)	−1.542 (0.062)
TE	−0.225 (0.411)	−3.697 (0.000)	−1.805 (0.036)	−3.015 (0.001)
CAB	0.364 (0.642)	2.028 (0.979)	0.699 (0.758)	−5.090 (0.000)
GDS	−0.095 (0.185)	−5.164 (0.000)	1.528 (0.937)	−1.157 (0.124)
TI	0.028 (0.511)	0.697 (0757)	−0.632 (0.264)	−0.176 (0.430)
UR	−2.242 (0.012)	−4.982 (0.000)	−1.288 (0.099)	−2.904 (0.002)
CPI	−6.627 (0.000)	−6.006 (0.000)	3.900 (1.000)	−4.807 (0.000)
GNS	−4.722 (0.000)	−2.989 (0.001)	0.662 (0.746)	−0.738 (0.230)
DIE	−2.912 (0.002)	−2.454 (0.007)	0.500 (0.691)	−3.947 (0.000)
POP	−1.997 (0.023)	−2.434 (0.007)	0.120 (0.548)	−2.166 (0.015)

Note(s): *CADF critical values:* −2.440, −2.220 and −2.100 for developed countries at 1%, 5 and 10 significance level, respectively, while for developing countries they are −2.560, −2.290 and −2.150, respectively
Source(s): Created by authors

Table A4.
Unit root test results

Corresponding author
Mehmet Bağış can be contacted at: mehmetbagis@subu.edu.tr