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Abstract

Purpose: Despite the popularity of the entrepreneurial ecosystem (EE) concept, research on its value-adding activities receives less attention. Thus, in this article, the authors investigate the role of EEs in supporting global value chain (GVC) activities.

Design/methodology/approach: The authors employ the fuzzy-set qualitative comparative analysis (fsQCA) technique to identify practical configurations of EE's framework and systemic conditions spurring GVC activities in 80 countries.

Findings: The findings suggest different configurations of EE`s framework and systemic conditions necessary for various GVC activities regarding input-output structure, geographical scope, upgrading, and forward and backward participation.

Originality: This study contributes to the extant literature by pioneering the EE approach in explaining GVC development. Moreover, the findings provide novel insights for understanding the entrepreneurial ecosystem—global value chain interplay. As a result, the study offers a more nuanced understanding of how the entrepreneurial ecosystem supports global value chain activities.

Keywords: Entrepreneurial ecosystems, Global value chain participation, Internationalisation, Innovation, Fuzzy-set QCA

Paper Type: Research Paper

1. Introduction

The recent rapid developments in information and communication technologies and the deregulation of cross-border trade and investment have altered how companies operate and compete in international markets. Not only have these advancements enabled firms to fragment and disperse their production activities internationally across various geographical settings (Ambos *et al.*, 2021), but they have also been vital for improving firms' efficiency and giving rise to global value chains-GVCs (Kano *et al.*, 2020). GVCs involve a series of value-adding development stages that a product or service goes through before it is ready for use (Kano *et al.*, 2020). A firm can participate in GVCs if it engages in at least one of the value-adding activities, such as research and development, production, assembly, and distribution (Antràs, 2020). The spreading of the different stages of producing a single product across other firms in different countries highlights the importance of inter-firm relationships.

Scholars consider GVCs' benefits at different levels, such as firm, country, and global. GVCs boost firms' international competitiveness while also increasing their profitability and sustainability. For instance, a firm may undertake complex production stages in advanced economies with highly skilled labour and perform labour-intensive production activities in developing countries to benefit from lower costs and economies of scale. GVCs are potent drivers of productivity and job creation, increasing living standards (Kano *et al.*, 2020). Countries participating in GVCs import skills and technology contribute to economic growth and development (Antràs, 2020; Baglioni *et al.*, 2020). Furthermore, GVCs allow participatory countries to leap-frog their development process. Khorana et al. (2022) depict that at least two-thirds of global trade occurs within GVCs due to intra-country input-output linkages whereby the

output from an operation in one country forms part of the input for the production process in another country.

Over the past two decades, scholars have emphasised the importance of GVC in international trade (Kano et al., 2020). GVCs are characterized by different dimensions, namely, geographic scope, upgrading, input-output structure, and participation. Governance structure explains how firms control the value chain (Choksy et al., 2022; Pla-Barber et al., 2021), while geographic scope explains the global dispersion of the industry and the countries in which different GVC activities are conducted (Antràs and De Gortari, 2020). Upgrading describes the dynamic movement within the value chain (Ambos et al., 2021), while the input-output structure refers to transforming raw materials into final products (Kano et al., 2020). Participation reflects a country's link to GVCs for production and exports (Brumm et al., 2019; Tian et al., 2022). Such GVC activities are embedded and evolve within entrepreneurial political and socio-economic environments (Kano *et al.*, 2020), also known as an entrepreneurial ecosystem (EE) (Bendickson *et al.*, 2021; Lechner *et al.*, 2022). Therefore, EEs—the combination of elements and actors fostering productive entrepreneurship (Jones and Ratten, 2021), act as a designated space for GVCs. With that regard, GVC activities are nowadays conducted across multiple EEs, thanks to advancements in globalisation.

EEs, provide a conducive and fertile milieu for the firms involved in GVC activities. For instance, firms can easily upgrade their products and services in the contexts (ecosystems) that spur innovation (Kansheba 2020). A well-functioning EE is characterised by dense networks of entrepreneurs, investors, advisors, and other critical actors with a culture that encourages networking and connecting (Spigel and Harrison, 2018). Such flow of resources facilitated by EE

actors makes it easier for entrepreneurs and their related firms to engage in GVCs effectively. EEs comprise various elements and actors whose continuous interactions and interdependence are critical to the ecosystem's success (Stam and Van de Ven, 2021). These elements (eco-factors) include human capital, finance, leadership, intermediaries, markets, knowledge, institutions, networks, infrastructure, and talent. Stam (2015) further classified the EE elements into the framework and systemic conditions fundamental for value creation in EEs. Consequently, the interaction and interdependence of both EE framework and systemic conditions are pivotal to the functioning of GVC activities. Despite their relevance, research on how EEs support GVCs still needs to be explored and developed.

Furthermore, several scholars have emphasised the importance of EEs in shaping and spurring entrepreneurial activities (Bendickson *et al.*, 2021; Lechner *et al.*, 2022). However, while GVC activities are also considered entrepreneurial activities, the two major concepts (GVCs and EEs) are often studied in isolation, failing to highlight the link between the two. Consequently, when discussing GVCs and EEs, policymakers and practitioners are left without sufficient evidence to guide their decision-making. It is, therefore, critical to investigate the links between GVC and EEs to inform academia, policymakers, and practitioners. As a result, the authors believe that emphasising this link will advance research at the intersection of these two concepts. The authors set out to answer the following question: *how do entrepreneurial ecosystems support global value chains?* Specifically, the authors explore possible configurations of the EE framework and systemic conditions necessary for spurring various forms of GVC activities.

The paper provides four contributions. First, it examines how various EE conditions affect the primary GVC dimensions—input-output structure, geographic breadth, upgrading, and GVC

participation (Reis *et al.,* 2022). Previous research at the macro-level has looked chiefly at different drivers of GVC growth, including economic factors, cultural values, customer traits, 3D printing technologies, and blockchain technologies (MacCarthy et al., 2016; Griffith and Myers, 2005; Funk et al., 2010; Laplume et al., 2016; Treiblmaier, 2018). Second, there is a lack of a unifying theory for empirical investigations since the GVC theory has been criticised for its complexity and wide range of applications (Kano *et al*., 2020). Furthermore, Opoku-Mensah (2023) and Neilson et al. (2018) draw attention to the dearth of empirical research examining the theory's robustness, validity, and generalisability across various value chains.

Understanding the interrelationships between EEs and GVCs is therefore crucial for refining the theory of the GVC paradigm and advancing knowledge of the connections. Third, the authors conduct a cross-country examination of the EE-GVC linkages. This approach to studying GVC is considered relevant because it studies the phenomenon at hand by considering the heterogeneity of GVCs across countries and context conditions (Kim and Kang, 2023). Fourth, the authors employ a novel fuzzy-set qualitative comparative analysis (fsQCA) method to identify the precise EE conditions that give rise to GVC developments (Douglas et al., 2020). The technique suggests that GVCs cannot be explained by a single "standalone" EE condition but by combining systemic and framework conditions. Thus, the authors identify a variety of EE condition configurations for each GVC activity.

The remainder of this paper is as follows: the next section focuses on the study's theoretical framework, which reviews the literature on GVCs, EEs and the interplay between EE conditions and GVC dimensions. Section three provides for the methodology. The authors present the findings

in section four, followed by the discussion in section 5. The last section documents the conclusion, implications, and potential avenues for further research.

2. Theoretical framework

2.1 Global value chains

For decades, international production sharing was regarded as a component of international trade in which countries imported manufactured goods to include in their exports. However, reducing trade barriers and technological advancements has created opportunities for fragmenting the production processes at an international level. Ambos et al. (2021) pointed out further that two essential features of the contemporary economy have been the globalisation of production and trade, which contribute to the growth of industries, particularly in several developing countries. As a result of this globalisation, more firms are deciding to fragment their production processes by offshoring parts or components of goods to producers in distant countries. The typical 'made in', which indicates which country produces which goods, is now a thing of the past since most goods are "made in the world" (Antràs, 2020), all thanks to GVC, an essential feature of globalisation.

GVC is the set of value-added activities undertaken by economic actors to bring a product or service to end users, with two or more production stages taking place in another country (Kim and Rosendorff, 2021). GVCs also include pre- and post-production activities before and after the production process. Pre-production activities include research and design, while post-production activities can include marketing and distribution (De Marchi *et al.*, 2020). Firms in different countries participating in the production process are considered essential actors in the GVCs (Kim and Rosendorff, 2021). It further highlights the critical value that other countries have in producing goods and services while also highlighting the interdependence, interactions, and interconnections

between countries (Antràs, 2020). Compared to international trade, which focuses on importing and exporting activities between two countries, GVCs involve cross-border production processes among multiple countries.

As previously stated, firms are the focal point in GVCs. Participation in GVC does not imply that firms are trading goods across borders; instead, firms are linked to value chain activities through the value creation process. Although not new in developed countries, fragmentation and internationalisation of production processes have only recently spread to include developing and emerging economies. Small firms in these regions can participate in global production activities without mastering all the technological and managerial skills required to create a product (González-Serrano *et al.*, 2021). Alternatively, they concentrate solely on specific aspects of value chains in which they are most competitive (Wang et al. 2021).

While GVCs are essential to participatory economies, they also have negative consequences, such as environmental pollution (Antràs, 2020) and increased inequality (Kano *et al.*, 2020), especially in regions where chain activities require skilled labour. Notably, employment is skewed to only experienced individuals, leaving a more significant portion of the population unemployed. Furthermore, developing countries are disadvantaged in GVCs due to poor technology compared to developed countries (Kim and Rosendorff, 2021). As a result, some aspects of chain activities are only available to developed countries, resulting in trade disparities between developed and developing countries. The GVC dynamics depend on political and socio-economic environments where value chain activities occur. Among others, these environments include changes in legal and regulatory frameworks and local business institutions, which are thought to positively or negatively impact GVCs (Kano *et al.*, 2020). However, research into how exactly

these environments support GVC activities is scarce and underdeveloped, hence the focus of this research.

2.2 Entrepreneurial ecosystems

The metaphor EEs originates from two lineages, the regional and strategy literature. Both have common roots in the ecological systems as the interdependence between actors in a specific setting (Acs *et al.*, 2017). The regional entrepreneurship development literature focuses on the socio-economic performance differences across regions, e.g., the productivity levels or levels of innovations across different areas. Thus, attention is paid to firm agglomeration and the availability of knowledge institutions, among other things (Szerb *et al.*, 2019). For example, in a region with multiple firms concentrated in one specific location, knowledge spillovers may increase entrepreneurial performance compared to regions with a concentration of few or no firms. Furthermore, areas with high levels of human capital will likely outperform regions with little or no skilled labour. In the strategy literature, EEs emerge as a type of economic coordination in which a firm's success depends on internal/external factors and actors who provide complementary resources (Acs *et al.*, 2017).

Despite its scholarly and policy attention, the EE phenomenon still needs a unified (generally accepted) definition. For instance, Spigel (2017, p. 49) posits that ecosystems are the union of "localized cultural outlooks, social networks, investment capital, universities, and active economic policies that create environments supportive of innovation-based ventures". On the other hand, Stam and Van de Ven (2021, p. 810) define entrepreneurial ecosystems as a "system that produces successful entrepreneurship, and where there is successful entrepreneurship, there is a good entrepreneurial ecosystem". It is important to note that, despite various definitions of what

EEs are, they all have one thing in common: they all focus on creating a conducive environment for entrepreneurial activities. EEs consist of different interrelated and coordinated elements that promote entrepreneurship. EE literature groups these elements into systemic and framework conditions that holistically enable productive entrepreneurial activities (Stam, 2015).

The systemic conditions are the heart of the EE, including networks, finance, human capital (talent, knowledge) and support services (Stam and Van de Ven, 2021). Networks facilitate the exchange of information and resources among entrepreneurs in the EEs (Fernandes and Ferreira, 2022). Networks between entrepreneurs could be more vigorous in developing countries, as they rely on informal networks, than in developed countries with formal solid network ties (Cao and Shi, 2021). Such a difference explains why some EEs are more productive than others. The availability of fund providers in EEs, such as banks, seed and angel investors, and venture capitalists, is critical for entrepreneurial activities (Miles and Morrison, 2020). Universities and research institutes are also vital, as these institutions are the primary source of human capital (talent and knowledge) (Audretsch *et al.*, 2019; Lux *et al.*, 2020). Support infrastructure such as mentors, advisers, and other intermediaries (accountants and lawyers) can reduce entry barriers in EEs and facilitate new value and venture creation.

The framework conditions, on the other hand, include institutional environment (government policies and regulations and leadership), cultural support, market (demand, market dynamics and openness) and physical infrastructure (Stam, 2015). The institutional environment in EEs, such as the formal and informal institutions, government rules and regulations, and leadership, tends to be the guiding principles for entrepreneurs. EEs with conducive institutional environments enable entrepreneurs to identify opportunities, launch and successfully operate their ventures

(Fuentelsaz *et al.*, 2019; Khlystova *et al.*, 2022). Therefore, the quality of the institutional environment will either encourage or discourage entrepreneurial activities.

Culture is a significant factor that influences the entrepreneurial process, and it is thought to be formal and informal institutions that govern entrepreneurial activity across regions (Spigel, 2013). The multiple facets of entrepreneurial culture include entrepreneurial values that promote entrepreneurial spaces and practices, identity, experiences, and dynamic capabilities, as presented in the framework developed by (Donaldson, 2021). Despite its relevance, more than a supportive entrepreneurial culture is needed to ensure long-term entrepreneurial development; a combination of resources such as talent, networks, and risk capital is crucial to sustaining entrepreneurial activities (Spigel and Harrison, 2018). Furthermore, EEs can only be sustainable if there is market access for goods entrepreneurs produce (Kansheba 2020). Compared to urban areas, the need for more access to markets and customers in rural areas has been identified as a constraint to productive entrepreneurship (Miles and Morrison, 2020). Physical infrastructure is also a crucial ingredient and differentiating factor between urban and rural EEs. For example, EEs in rural areas are less developed, which inhibits entrepreneurial activities compared to EEs in urban areas with well-developed infrastructure.

2.3 The interplay between the EE conditions and global value chains

The relationship between EE conditions and GVC can be observed through the lens of complexity theory. Multinational corporations heavily involved in GVC are arguably among the most complex organisations (Sharma et al., 2022). Despite its novelty, the approach has been utilised more extensively in management (Eppel and Rhodes, 2018) and organisation science research (Bohórquez Arévalo and Espinosa, 2015) than in international business research. Using complexity

theory in social systems comprehends dynamic processes that were difficult to describe using existing equilibrium models (Beinhocker, 2006). The theory suggests that high-symmetric relationships between variables are rare, and the goal of science should be an accurate prediction of outcomes under specific conditions rather than focusing on the directionality of relationships or the importance of (individual) independent variables in multiple regression analysis (Woodside et al., 2017). A similar argument holds for the interaction between EE and GVC; in this example, GVC dimensions are best understood by investigating how holistically EE conditions in a holistic (configurational) fashion, rather than individual conditions, impact the GVC activities (González-Serrano et al., 2021). Thus, it is impossible to identify such interactions (configurations) by employing conventional linear models to demonstrate the relevance of relationships between EE conditions and GCV dimensions per complexity theory. While there is a dearth of literature on how EE conditions holistically influence GVC activities, existing literature provides evidence of the novelty of the configuration/holistic approach to studying how the former influences different outcomes. Prior studies have employed the configuration approach to demonstrate the impact of EE conditions on various aspects, including business growth (Torres & Godinho, 2022), the quantity and quality of regional entrepreneurship (Xie et al., 2021), individuals' inspirations to engage in entrepreneurship (Ali et al., 2019), and sustainable entrepreneurship (Huang et al., 2023). These studies provide evidence of a paradigm shift towards a holistic examination of how EE conditions affect other aspects, which aligns with EE systemic functioning.

Based on complexity theory, the study postulates how EE's systemic and framework conditions influence the different dimensions of GVCs: input-output structure, geographical scope, upgrading, and GVC participation. Because of the significance of this phenomenon to the global economy, the literature on macro-level causes of GVC configurations has been progressively

increasing. Previous research has examined the effects of various macro-factors on GVC, including economic variables like labour cost and supply, markets, and competition (MacCarthy et al., 2016). Several additional factors, including the cultural values of the nation (Griffith and Myers, 2005), consumer cultural features of the host country (Funk et al., 2010), 3D printing technologies (Laplume et al., 2016), and blockchain technology (Treiblmaier, 2018), have also been studied as drivers of GVC. The present research adds to the body of knowledge on the macro-level factors that influence GVC by emphasising EE conditions such as the accessibility of money, human resources, and R&D facilities in encouraging GVC configurations within countries. The following is a discussion of the theoretical underpinnings of the interlinkages between each GVC dimension and general EE conditions.

2.3.1 Input-output structure

A value chain comprises the input-output processes that take a product from conception to the end user. The GVC input-output structure shows the flows of intangible and tangible goods and services that are important in tracking the value added at each value chain stage (Kano *et al.*, 2020). Due to the fragmentation of production into different stages, a firm may participate in one stage of the value chain or be responsible for several value-adding activities along the chain (Antràs, 2020). Thus, it may obtain inputs from various countries, while its outputs are sold as inputs for other chains or as final products to end users at home or abroad (Baglioni *et al.*, 2020).

Each stage in the value chain may require specific systematic and/or framework conditions of EEs to be completed. For instance, research and development (R&D) activities are significant inputs in the value chain. R&D is fundamental in GVCs because it provides valuable knowledge for improving existing chain activities (or stages) and developing new products and services that

can compete in international markets (Spigel, 2017). EEs inhabit human capital— individuals` combination of skills, knowledge, and experience (Stam and Van de Ven, 2021). Universities and research institutions have been lauded for being the primary source of human capital (talent and knowledge). They provide the workforce training required by existing and startup firms (Audretsch *et al.*, 2019). Graduates of these institutions possess innovative and creative abilities, which are required for R&D activities in GVCs. Therefore, firms will locate in EEs with universities and other learning institutions to access the human capital necessary for their R&D activities.

2.3.2 Geographical scope

The geographical scope (internationalisation) dimension focuses on the global dispersion of an industry and the different countries where specific value-added activities are taking place (Antràs and De Gortari, 2020). It is further associated with the international splitting of value chain activities and how value is created by different actors across different locations (De Marchi *et al.*, 2020). It also emphasises the transaction cost mechanisms, such as outsourcing production activities, as the primary driver of value creation in GVCs (Siaw and Okorie, 2022). In addition, the interconnectedness of firms in the value chain enables the flow of resources across different geographical settings. Networks are the mechanisms by which different firms in other regions interact (Tian *et al.*, 2022) and thus facilitate the exchange of resources between firms and countries.

2.3.3 Upgrading

GVC upgrading refers to the process by which economic actors, nations, firms, and workers move from low-value to relatively high-value activities to increase the benefit of participating in global production networks (Gereffi, 2019). It has also been associated with product, process, and function (upgrading) innovation activities (Kano *et al.*, 2020). Firms may use more efficient technologies to

convert inputs to outputs (process upgrading) or switch to a new product line (product upgrading). Firms may also choose to discontinue certain functions or acquire new value-added functions (functional upgrading), or they may choose to enter a new but related industry (sectoral upgrading) (Fernandez-Stark and Gereffi, 2019).

For successful upgrading activities, various skills, access to finance, entrepreneurial culture, and government policies are crucial (Reis *et al.*, 2022). As a result, regions with the presence of universities that can provide the necessary skills and financial providers (Miles and Morrison, 2020) will find it much easier to add economic value to their products through upgrading than regions lacking talent and financial capital. Furthermore, regions characterised by supportive entrepreneurial cultures such as risk-taking, proactiveness, and innovation (Stuetzer *et al.*, 2018) are likely to engage in higher value-adding activities than other regions. In addition, regions with entrepreneurial-friendly government policies and entrepreneurial support services such as insurance and consulting services may encourage firms to shift from low-value-added to higher-value-added activities. All these propositions align with Ambos et al. (2021), who posit that different government policies and strategies, available technology and skilled labour play a critical role in upgrading success.

2.3.4 GVC participation

The GVC participation entails how much a country is linked to GVCs for its production and exports (Kano *et al.*, 2020). A country participates in GVC by purchasing foreign inputs for use in the producing goods and services it exports (backward participation) or by exporting locally manufactured inputs to foreign partners for use in production (forward participation). Therefore, backward participation refers to the proportion of imported value added to produce domestic

exports. In contrast, forward participation refers to the ratio of domestic value added to a foreign partner's export (Tian *et al.*, 2022).

Two main factors influence GVC participation—policy and non-policy factors. Regarding policy factors, regions with favourable government policies encouraging entrepreneurial activities, such as low taxes on raw material imports, will encourage backward participation. However, areas with high import tariffs (on inputs) will discourage backward participation while encouraging forward participation (Reis *et al.*, 2022). Therefore, backward GVC participation encourages upgrading by enabling some regions to source sophisticated inputs from other countries for their higher-level value-adding activities (Tian *et al.*, 2022). For non-policy factors, the infrastructural development of regions also tends to influence GVC participation rates. Areas with well-developed infrastructure (both physical and economic), such as manufacturing factories, airports, railways, motorable roads, and telecommunications systems, will be well-positioned to participate backward in GVCs since the available infrastructure can enable the production of exports locally. Furthermore, market dynamics impact both forward and backward GVC participation (Tian *et al.*, 2022). Regions with high demand for locally produced goods but no supporting infrastructure, such as manufacturing plants, will likely be involved in forward GVC activities and vice versa.

3. Methods

3.1 Data and sample

The sample comprised 400 observations from 80 countries. The dataset is compiled from two major global databases, the Organisation for Economic Cooperation and Development (OECD) and Global Entrepreneurship Monitor (GEM), organised by the Global Entrepreneurship Development Institute (GEDI).

3.2 Variable operationalisation

FsQCA involves two types of variables: conditions and outcomes. First, the authors consider GVC in-output structure, geographical scope, (product and process) upgrading, and (forward and backward) participation as the study's main outcomes. In addition, the entrepreneurial ecosystem`s framework (government support and policies, tax and bureaucracy, government programs, physical infrastructure, market dynamic and openness, and culture) and systemic (finance, basic and post-education, R & D transfer, networking, and commercial infrastructure) conditions were further considered as conditions.

Input-Output structure: According to Gereffi (2019), the input-output structure represents the value added under different stages of a value chain, such as input supply, production, distribution, and marketing. It also describes the participants (actors) who engage in those stages and how their interactions with one another result in the delivery of goods and services to customers (Reis *et al.*, 2022). Thus, the authors adopt the OECD country`s total value-added indicator, which reflects the value generated by producing goods and services, measured as the value of output minus the value of intermediate consumption (OECD, 2022).

Geographical scope: This refers to the geographic distribution of value chain activities regarding how firms engage with and integrate other firms, suppliers, and customers regionally, nationally, or internationally (Kano *et al.*, 2020). Gereffi (2019) argued that the phenomenon could also be associated with the internationalisation focus (activities) of upstream and downstream companies in the context of multinational businesses. Consequently, the authors adopted the GEDI internationalisation indicator, which captures the extent of countries` internationalisation as the

exporting potential of their companies while controlling the extent to which the country can produce complex products.

Upgrading: Upgrading dimension of GVC describes how companies and regions can enhance their managerial and technological capabilities to participate in more value-adding stages in a chain (Ambos *et al.*, 2021). Companies usually spark upgrading activities by creating more effective and creative production processes (process upgrading) or competitive and innovative products (product upgrading). Thus, the authors employ GEM`s product and process innovation indicators as the measures of product and process upgrading activities. According to Kansheba (2020), product innovation represents a country's potential to generate new products and adopt or imitate existing ones. It is also referred to as technology and innovation transfer (whether a business environment allows the application of innovations for developing new products). Furthermore, GEDI refers to process innovation as a country's potential to apply and/or create new technology (as the percentage of businesses whose principal underlying technology is less than five years old) (Kansheba and Wald 2022).

Forward GVC participation refers to the "seller" or "supply" side of GVC participation. It estimates the domestic value added in inputs sent to "third economies" to undergo further processing and export through supply chains. This occurs when intermediate goods or services are exported to a partner economy, which re-exports them to a third economy. The degree of a country's forward GCV participation is determined by the share of its domestically produced inputs in third countries' exports (Khorana *et al.*, 2022). It is calculated as the ratio of domestic value added (to other countries) to the country's aggregate gross exports (World Trade Organisation, 2019).

Backward participation refers to the "buyer" or "demand" side of GVC participation. It estimates the value of foreign value-added content, i.e., from imported intermediate goods and services in the economy's total exports. The magnitude of backward GVC participation in an economy is reflected in its reliance on foreign inputs to produce its exports (Khorana *et al.*, 2022). It is calculated as the ratio of foreign value-added content of exports to the economy's total gross exports (World Trade Organisation, 2019).

EE framework and systemic conditions: Stam and Van de Ven (2021) described EE conditions (elements) in terms of framework and systemic conditions. The framework conditions include the social (informal and formal institutions), physical, and market conditions enabling or constraining human interaction. On the other hand, systemic conditions include networking, leadership, finance, talent, knowledge and (commercial infrastructure) support services. Stam (2015) regarded framework conditions as the fundamental causes of value creation in the EEs. This author further viewed systemic conditions as the heart of the EE, as their presence and interactions predominantly determine the ecosystem's success. Thus, the authors employ the following GEM indicators for the abovementioned conditions.

Seven indicators represent the framework conditions. 1) *Government support and policies*: the extent to which public policies support entrepreneurship—entrepreneurship as a relevant economic issue. 2) *Taxes and bureaucracy:* the extent to which taxes or regulations are either size-neutral or encourage new ventures and SMEs. 3) *Government programs*: the presence and quality of programs directly assisting SMEs at all levels of government (national, regional, municipal). 4) *Physical infrastructure:* ease of access to physical resources such as communication, utilities, transportation, land, or space at a price that does not discriminate against SMEs. 5) *Market*

dynamics: the level of market change from year to year. 6) *Market openness:* the extent to which new firms can enter or exit the existing markets. 7) *Culture:* 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.

On the other hand, the systemic conditions were presented by six indicators. 1) *Finance*: the availability of financial resources such as equity and debt for small and medium enterprises (SMEs) (including grants and subsidies). 2) *Basic education*: the extent to which training in creating or managing SMEs is incorporated within the education and training system at primary and secondary levels. 3) *Post education:* 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/universities, etc. 4) *R & D transfer*: the extent to which national research and development will lead to new commercial opportunities and is available to SMEs. 5) *Networking*: essential networking potential of a possible entrepreneur as the percentage of the population who personally knows an entrepreneur who started a business within two years. 6). *Commercial and professional infrastructure*: property rights, commercial, accounting, and other legal and assessment services and institutions that support or promote SMEs.

Before further analyses, the authors performed different data reliability tests whose results proved the dataset reliable (see Appendix 1). Table 1 provides the descriptive results of the employed sample.

*****Insert Table 1 here*****

3.3 Data analysis

The authors used a fuzzy-set qualitative comparative analysis (fsQCA) method to analyse the data. Its main emphasis is that potential combinations of conditions significantly impact a given outcome more than any single (stand-alone) condition (Eng and Woodside, 2012). As a result, the fsQCA considers several strategies (approaches) to get a particular outcome. The fsQCA requires the dataset to be transformed into the log-odds metric, with all values between 0 and 1. However, Ragin (2018) cautioned further that the precisely 1 and 0 membership thresholds (breakpoints) would correspond to positive and negative infinity, respectively, for the log of odds. Thus, instead of using the 0 and 1 membership scores range, the authors followed Pappas and Woodside (2021) suggestions and considered 0.05, 0.5, and 0.95 thresholds (breakpoints) for data calibration. The first value (0.05) considers an observation entirely outside the set (non-membership). The second value (0.50) assumes a midpoint, neither inside nor outside the set (crossover point). Finally, the third value (0.95) considers the observation entirely inside the set (full membership). Similar thresholds have been utilised by other studies (e.g., Wang et al. (2022).

The authors used the 5%, 50%, and 95% percentile computation to determine which values in their dataset correspond to the 0.05, 0.5, and 0.95 (see Table 1). They used these values as the three breakpoints for data calibration in fsQCA software. After data calibration, the authors performed the necessity and sufficiency tests to evaluate the effect of the different EE conditions on GVC dimensions. The authors first performed a necessity test. Pappas and Woodside (2021) document that a condition is necessary when it must always be present in the occurrence of a particular outcome. Thus, consistency, in this case, denotes how well the condition can forecast a

specific result. According to González-Serrano et al. (2021), for a condition to be considered necessary, its value should be ≥ 0.90.

The authors then performed the sufficiency analysis of the conditions. In calculating the sufficiency conditions, the fsQCA analysis consists of two stages (Wang et al. 2022). First, a truth table algorithm transforms the scores in a fuzzy data set into a truth table that lists all logically possible combinations of causal conditions and the empirical result of each configuration. Second, fsQCA produces three possible solutions: complex, parsimonious, and intermediate. The complex solution provides all the possible combinations (configurations) of conditions, and then traditional logical operations are applied. However, its complexity arising from many configurations (solutions) makes its interpretations impractical (Pappas and Woodside, 2021). Thus, the complex solutions are simplified into parsimonious and intermediate solution/configurational sets.

The parsimonious solution presents the most important "core" conditions that cannot be omitted from any configuration. Unlike a complex solution, the parsimonious solution includes any counterfactual combination for logical and simplified configurations. The intermediate solution is generated by performing counterfactual analysis on the complex and parsimonious solutions, including only theoretically plausible counterfactuals (Pappas and Woodside, 2021). The conditions eliminated in the parsimonious solution, and appearing only in the intermediate solution are referred to as "peripheral conditions". Therefore, merging the parsimonious and intermediate solutions offers a more detailed and aggregated view of the findings (Wang et al., 2022). Thus, the authors highlighted the intermediate solution by identifying the "core" conditions (those appearing in both parsimonious and intermediate solutions) and "peripheral" conditions (those that appear only in the intermediate solutions).

Finally, the critical advantage of fsQCA over conventional variance-based approaches such as linear multivariate analysis, cluster analysis, ANOVA, and MANOVA is worth mentioning. Variance-based approaches often evaluate variables` net effects in a competitive environment, focusing on the effect of individual variables. In contrast, fsQCA focuses on the intricate and asymmetric relationships between the outcome of interest and its antecedents/conditions (González-Serrano *et al.*, 2021). Consequently, fsQCA is popularised as an adequate tool for understanding complex social phenomena as clusters of interrelated conditions, such as entrepreneurial ecosystems and their impact on GVC (Kraus *et al.*, 2018). For instance, under the variance-based approaches (e.g., correlation, regressions) that assume linear (symmetrical) relationship among variables, it can be concluded that high government interventions (e.g., supports and programs) lead to high GVC upgrading (product and process innovation) activities, and the vice versa.

However, under complexity and configuration theories, high GVC upgrading activities are likely to exist even when government interventions are low (absent), suggesting that the condition is sufficient but unnecessary. Also, sometimes high (presence) of government interventions may lead to high GVC upgrading activities only when a third condition is present or absent (high or low) (e.g., quality physical and commercial infrastructures, R & D). Thus, the use of fsQCA becomes an ideal technique for this study as it enables the authors to capture the conditions that are not only sufficient or necessary to explain the outcome but also those that are insufficient on their own but are necessary parts of the effective configurations in explaining the outcome. The authors used fsQCA 3.0 software to perform these configurational analyses.

4. Results

4.1 Necessary and sufficient conditions

Results in Table 2 show that no single EE (standing alone) condition is necessary for explaining the GVCs as none of the conditions has a consistency exceeding 0.90, as recommended by prior studies (González-Serrano *et al.*, 2021).

*****Insert Table 2 here*****

Furthermore, results in Tables 3, 4, and 5 confirm that the fsQCA models are adequate, informative, and valid as under all dimensions of GVC, the overall configurational (solution) consistencies are above 0.80 (Wang et al. 2022), except for input-output structure. Thus, all identified EE conditions' configurations are sufficient for supporting the GVC activities except for the input-output structure. The fsQCA produces three different coverage scores to gauge the ability of the configurations to capture real-world scenarios. The overall solution coverage scores are above 50%, meaning the identified configurations holistically explain most GVC instances except for the input-output structure. Raw coverage entails the empirical relevance of each configuration by indicating how much it explains the outcome.

In contrast, unique coverage demonstrates the relative importance of each configuration by removing overlapping elements (Kraus *et al.*, 2018). The results indicate the presence of several equifinality configurations suitable for various settings, as seen by the raw and unique coverage of each configuration exceeding 10%. Moreover, to obtain a minimum (meaningful) number of observations (cases) for the assessment of the configurations, the frequency (i.e., the number of observations for each possible configuration) thresholds is set. While a higher frequency threshold indicates that each combination (configuration) refers to more observations in the sample and thus

reduces the sample coverage explained by the retained configurations, a lower frequency threshold indicates fewer observations (cases) in the sample but increases its coverage.

Ragin (2018) and Fiss (2011) recommended a frequency threshold of 3 (or higher) for samples larger than 150 cases and a frequency threshold of 2 for smaller samples. As the study sample is 400, the authors set the frequency thresholds at three and removed all combinations with smaller frequency from further analysis. The authors also set the consistency thresholds (the strength of the superset or subset relationship) at 0.8, which corresponds with (an alternative measure of the consistency) proportional reduction in inconsistency (PRI) value of 0.5 and above as recommended by Pappas and Woodside (2021). The PRI measures how the observed cases can be explained by the logical relationships between the conditions of the explanatory (input) and outcome (output). PRI can also be used to evaluate the model's goodness of fit.

4.2. Identification of effective configurations

The results revealed various configurations of EE conditions that can explain (induce) the GVC dynamics, as shown in Tables 3, 4, and 5. The authors found four configurations (solutions) that explain 67% of the cases of the *geographical scope* of GVC (overall consistency and coverage of 88% and 67%, respectively). The most explanatory (raw coverage of 51%) is the combination of the presence of high (core) levels of physical infrastructure and post-school education, the presence of low (peripheral) levels of government support and policies, tax and bureaucracy, government programs, market dynamics and openness, culture, finance, basic-school education, R&D transfer, networking, and commercial (support service) infrastructure. The second most explanatory (raw coverage of 41%) differs from the first by the presence/absence of market dynamics, basic-school education, networking, and the core/peripheral absence of finance and culture. The third most

explanatory (raw coverage of 40%) slightly differs from the first by the presence/absence of networking and core absence of finance. The least explanatory (raw coverage of 34.6%) differs from the first by the presence/absence of R&D transfer, peripheral absence of government support and policies, tax and bureaucracy, government programs, networking, and the core absence of finance.

*****Insert Table 3 here*****

The authors further found four configurations explaining 82% of the cases of *product upgrading* (overall consistency and coverage of 81% and 82%, respectively); see Table 4. The most explained one (raw coverage of 49.7%) is the combination of the presence of high (core) levels of government support and policies, tax and bureaucracy, government programs, market openness, R&D transfer, low (peripheral) levels of physical infrastructure, finance, post-school education, networking, commercial (support services) infrastructure, presence/absence of culture, basic-school education, and peripheral absence of market dynamics. The second most explanatory (46.4%) slightly differs from the first by the presence/absence of physical infrastructure, market dynamics, culture, finance, and networking. The third (46.3%) and fourth (39.9%) differ from the first by the peripheral absence of market openness, finance, and basic-school education. Moreover, all identified configurations share the same high levels of physical infrastructure, post-school education, and commercial (support services) infrastructure.

The results further show five configurations explaining 81% of the cases of process upgrading (overall consistency and coverage of 92% and 81%, respectively). The most explained configuration (50.3%) is the combination of the presence of high levels of government support and policies, tax, physical infrastructure, market dynamics and openness, basic-school education, R&D transfer, low levels of government programs, post-school education, commercial infrastructure, and

the presence/absence of culture, finance, and networking. The next (45.7%) slightly differ from the first by the presence/absence of basic-school education and peripheral absence of market dynamics. Finally, the rest of the configurations vary from the prior two by the mix of core/peripheral absence of various EE conditions, as shown in Table 4. Notably, all five configurations share the same aspects of high levels of physical infrastructure, R&D transfer, and low-level commercial (support services) infrastructure.

*****Insert Table 4 here*****

Table 5 provides the set of configurations for GVC *forward and backward participation*. The authors found three configurations under each, explaining 73% (consistency: 89%) and 79% (consistency: 84%) of forward and backward participation (coverage of 73% and 79%, respectively). The most explained configuration (58.1%) under forward participation is the combination of the presence of high levels of government support and policies, tax and bureaucracy, government programs, physical infrastructure, market dynamics and openness, finance, low levels of basic and post-school education, R&D transfer, networking, commercial infrastructure, and the presence/absence of culture. The second most explained configuration (53.5%) differs from the first by the peripheral absence of market dynamics, openness, and basic-school education. Finally, the least explained configuration (51%) differs from the most explained one by consisting of several conditions identified as either core/peripheral absent, with only tax, physical and commercial infrastructure, and networking being either core/peripheral present.

The configurational results also reveal three related (with slight differences) configurations explaining GVC backward participation. The most explained configuration (51.4%) shows that both EE framework and systemic conditions are crucial for supporting GVC backward

participation. Specifically, government support and programs, physical infrastructures, market openness, post education and R&D have been identified as core conditions, while taxes, finance, and commercial infrastructures are peripheral conditions. Moreover, the results show the peripheral absence of some conditions (e.g., taxes and basic education), meaning that they do not influence (support) backward participation. See configurations 1 and 2.

*****Insert Table 5 here*****

To assess the robustness of fsQCA, the authors reperformed the analyses by setting new mid- (cross-over) calibration membership breakpoints at the 45th (-0.1) and the 55th (+0.1) percentile, following Wang et al. (2022). The authors also edited the truth tables by raising the consistency threshold from 0.80 to 0.90 (Pappas and Woodside, 2021). The two processes can also be used to identify substitutable conditions, if any exist (i.e., overlapping conditions with similar contributions to the outcome under study). The presence (existence) of substitutable conditions helps the researchers better comprehend the intricacy of the relationships between conditions and outcomes. The fsQCA results robustness check revealed marginal (insignificant) changes in overall solution consistencies. New configurations did not deviate from the original ones, suggesting the absence (no evidence) of meaningful substitutable conditions. The authors explain the possible circumstances for the lack of evidence for conditions' substitutability in this study under the discussion section.

5. Discussion

While GVC activities occur in EEs, more research should be conducted on how EEs support GVCs. The findings of this study indicate that no standalone EE condition can be used in explaining GVCs. Instead, the study finds four configurations of EE conditions necessary for the *geographical scope*

of GVCs, indicating that different combinations of EE conditions can explain why a firm decides to locate a specific stage of its manufacturing in a particular region. However, the authors emphasise the most explanatory configurations of EE conditions, which include a combination of the presence of high (core) levels of physical infrastructure and post-school education and the presence of low (peripheral) levels of government support and policies, tax and bureaucracy, government programs, market dynamics and openness, culture, finance, basic-school education, R&D transfer, networking, and commercial (support service) infrastructure. As provided by Audretsch et al. (2019) and Miles and Morrison (2020), firms tend to locate their production stages mostly in regions with the presence of physical infrastructure (e.g., highways, railways, and telecommunication networks) and knowledge institutions such as universities and research hubs. Learning and research institutions facilitate knowledge creation and transfer within EEs and thus generate skilled and talented graduates who can complete GVC production activities.

The study further reveals four configurations of EE conditions explaining *upgrading* activities in GVCs. These are concerned with how firms or regions transition from low-value-added activities to relatively high-value-added activities to maximise their benefit from participating in GVCs production stages (Kano *et al.*, 2020). The authors, however, stress the most explanatory configuration of EE conditions, which includes physical infrastructure (mentioned in the geographical scope), high levels of government support and policies, tax, market dynamics and openness, basic-school education, and R&D transfer. Thus, these factors should be considered in addition to the other conditions mentioned earlier. Implementing entrepreneurship-friendly policies and programs, such as lowering market entry barriers for new firms and providing financial assistance to entrepreneurs, encourages firms and regions to engage in upgrading activities.

Furthermore, governments and businesses must invest in R&D facilities to spur innovations (upgrading) in different areas. Prior research also suggests that EEs have rules, regulations, and support programs to assist start-ups and high-growth ventures in innovating (upgrading) their products and services (Stam and Van de Ven, 2021). Furthermore, EEs that in-house universities and research institutions that spur entrepreneurial creativity and innovation are crucial in supporting GVC upgrading activities.

The study also reveals three configurations of EE conditions linked to forward and backward participation. The most described configuration for forward participation in GVCs includes the combination of high levels of government support and policies, tax and bureaucracy, government programs, physical infrastructure, market dynamics and openness (mentioned earlier in the geographical scope and upgrading dimension) and finance. This indicates that in addition to the other conditions mentioned previously, the presence of financial resources (such as equity and loan facilities) within a region will encourage that region to engage in forward participation in GVCs. Finance is crucial for the growth and survival of entrepreneurial ventures (Stam and Van de Ven, 2021). These findings align with prior evidence, which indicates that EEs with a pool of angel investors, venture capitalists, investors, and other funding institutions (Miles and Morrison, 2020) that may provide access to loans will have firms that take part in forward participation in GVCs. Since GVC activities are entrepreneurial activities, these findings also back up previous research, which indicates that markets, government support, physical infrastructure and finance are essential elements that positively impact entrepreneurial activities (Stam, 2015; Stam and Van de Ven, 2021).

The configurational findings show that both systematic and framework conditions of EE support GVC backward participation. The authors stress the most explained configuration, which

is a combination of core conditions of government support and programs, physical infrastructures, market openness (explained in forward participation), post education and R&D. Therefore, in addition to the combination of conditions necessary for forward participation, to engage in backward participation, regions need to focus on incorporating training and skill development programs into the curriculum of higher education institutions so that the population can acquire the necessary skills to participate in GVCs. Also, regions with well-established research facilities will be able to identify new opportunities compared to areas lacking such facilities. In line with these findings, several studies report that entrepreneurial ecosystems are natural habitats for such entrepreneurship-focused support programs, higher institutions of learning and research facilities (Audretsch *et al.*, 2019; Stam, 2015; Stam and Van de Ven, 2021) and thus well-suited in supporting backward participation in GVCs.

While it is useful when applying the fsQCA to identify substitutable conditions for practical implication flexibility, the results' robustness assessment did not reveal their existence in the studied dataset. Lack of non-substitutability of the conditions can be due to two reasons. The first reason is the conditions' distinctness and their non-overlapping contributions. In certain instances, the variables under investigation possess inherent uniqueness where no other circumstances can replicate their effects. The authors investigate the impact of intricate phenomena (the EE) whose components (conditions) have unique and crucial influence on the outcome (GVC). The second (and the most vital) reason is the existence of complex and non-linear relationships between the studied variables. In such a situation, configurations depend on complex interactions or synergetic effects that are impossible to replace.

There are several reasons to support the non-linear relationship between EE conditions and GVC activities. For instance, positive government initiatives, such as support and subsidies, can entice companies to participate in GVC operations due to lower initial entrance barriers and motivation for interacting with international partners. However, overzealous government actions may result in declining results. Businesses that depend too much on government assistance may put immediate profits ahead of sustained competitiveness. This could discourage GVC upgrading efforts and breed complacency. While funding is essential, its excess might not entail increased (improved) GVC involvement. Businesses that occasionally have easy access to excessive funding might not prioritise GVC engagement in favour of domestic expansion or less hazardous endeavours.

Moreover, a surplus of funds may cause businesses to misallocate resources by funding projects that do not advance value chain integration. Also, overfunding can potentially cause firms to become risk-averse by emphasising asset protection over risk-taking in GVC activities. Similarly, a sufficient talent and human capital supply can boost GVC upgrading efforts at first. However, yields may diminish if a skills mismatch or the talent supply exceeds the demand. In these situations, companies might not make the most of the talent on hand, which could result in underemployment and a shift in emphasis toward internal or non-GVC-related tasks.

Non-linearity between EE conditions and GVC activities can be further evident through market dynamism and openness. Companies may give local markets more importance than international ones because of the prospects found in a vibrant and open domestic market. On the other hand, a decline in market openness and dynamism may lead to a rise in the GVC input-output structure. Businesses may go to international markets to maintain growth when home markets

stagnate. Similarly, more R&D expenditures may cause the GVC input-output structure to contract. Companies might devote more funds to R&D, emphasising product innovation more than participating in various GVC activities.

Conversely, a decline in R&D operations can result in a rise in GVC forward participation. Businesses may participate in GVC to gain access to new markets and technology if they have limited resources for innovation. Lastly, the non-linear relationship can be evident through the impact of dynamic networking and collaboration. Extensive local (domestic) collaborations and networks might eliminate the need for external networks emanating from GVC engagement. However, enterprises may look for external collaborations within the GVC to access resources and competencies if there is not enough domestic collaboration.

6. Conclusion

6.1 Theoretical implications

Research on the role of EEs in GVCs is underdeveloped and scarce (Reis *et al.*, 2022), even though GVCs and their activities are embedded within EEs. As such, this study significantly contributes to this scarcity by providing an early exploration of the interplay between the EEs` framework and systemic conditions and GVCs activities using fsQCA. Also, this study offers a novel theoretical contribution to the EE literature and GVCs by identifying different configurations and combinations of EE elements that support the development of GVC activities in terms of input-output structure, geographical scope, upgrading, and GVC participation. Furthermore, the study contributes to complexity theory by explaining the complex relationships and links between EE systemic and framework conditions and different GVC activities. The study also contributes significantly to the entrepreneurship literature by emphasising the vital role EEs play in developing entrepreneurial

activities, such as various activities undertaken in the different stages of GVCs. Finally, the study contributes to and extends the literature on the intersection of EE conditions and GVC activities, emphasising the need to study the two concepts in tandem and not in isolation.

6.2 Practical implications

The study has implications for both entrepreneurs and policymakers. For entrepreneurs, locating their businesses should be guided by preliminary research to determine whether the local or regional conditions are favourable. This includes looking for regions with easy access to EE systemic (finance, talent, networks) and framework (support, infrastructure, culture, markets) conditions. Prior research has shown that GVC contributes to participating nations` economic growth and development (Baglioni *et al.*, 2020; Kano *et al.*, 2020). It is also important to note that governments may only join GVCs if their EEs are (healthy) conducive enough. As a result, policymakers in various EEs are encouraged to create policies promoting entrepreneurial activity, spur GVC activities, and lead to more economic growth and development. Also, governments and businesses should invest in developing infrastructure and implementing entrepreneurship-friendly policies to encourage regions and firms to participate in GVCs.

It is also important to emphasise that while GVC improves economic efficiency, production, and employment while also increasing the availability of intermediate products (Kano *et al.*, 2020), deglobalisation would harm countries that participate in GVC (Gopalakrishnan *et al.*, 2022). As a result, policymakers are encouraged to create efficient and effective economic structures and infrastructure, dependable institutions, strategic partnerships, networks, and efficient human capital capable of attracting international investment even in the face of deglobalisation, ensuring economic development and growth. Furthermore, policymakers should act as gatekeepers and establish dependable and efficient national political systems and trade relationships

with neighbouring countries, as this will facilitate the flow of goods and services, finances, and human capital in the event of deglobalisation, which may become a constraint for participation in GVC.

Furthermore, policymakers should provide a stable regulatory environment and constantly re-evaluate their policies to ensure that they are entrepreneurship-friendly, as this may also encourage the development of entrepreneurial ventures in their jurisdiction while attracting international businesses. Policymakers could also promote the formation of relationships between potential entrepreneurs and companies involved in various stages of GVC activities, as this could result in the emergence of new entrepreneurial ventures and, as a result, economic development. Further, the authors argue that entrepreneurship training programs should be incorporated into basic and post-graduate education to provide the necessary skills needed by entrepreneurs in creating and managing sustainable ventures that cannot only join but also compete in GVCs. EEs' initiatives should spur startups, scaleups, and high-tech firms to engage in GVCs by developing the necessary skills in these specializations.

6.3 Future research

The study utilizes a fsQCA-based dataset from 80 countries. Despite its superiority over other conventional analytical techniques, the fsQCA does not explore the dynamics embedded in the two studied phenomena. EEs' conditions and GVC activities are dynamic and evolve (Kano *et al.*, 2020). Thus, future research can explore the EEs' and GVC's interplay dynamics. The configurational analyses in this study do not show evidence of the influence of EEs on the input-output structure of GVCs. Future research can explore how various EE conditions impact the input-output activities of the GVCs. Both conceptual and in-depth studies will enrich the understanding of the mentioned gap. The authors' analyses did not incorporate the governance aspect of GVC due

to its operationalisation difficulties. Thus, future research can embark on developing a measurement framework for GVC governance, which will open room for studying its connectedness with EE.

Research indicates that digitalisation shapes the locus of entrepreneurial opportunities and transforms best entrepreneurial practices and activities. As such, future research could explore the impact of digitalisation in shaping the participation of different countries in GVC. This aspect could particularly be explored in developing countries due to their limited involvement in GVCs. Also, the data analysed in this study consisted of 400 observations from 80 countries between 2014 and 2018 sourced from OECD and GEDI databases. This analysis can be done with updated data from these same databases or other databases to find out if the findings of this study have changed or are still relevant—future research can embark on this. Finally, the study focused on specific EE systematic and framework conditions from Stam's (2021) framework, which does not incorporate other vital elements (conditions) such as intermediaries, institutions and leadership. Future research could explore the interplay of these EE elements with GVC activities.

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Appendix A: Data reliability tests

S/N	Assumptions	Test(s)	Seek values
1	No heteroskedasticity problem	*Breusch-Pagan hettest* Chi2(1): 0.003 p-value: 0.958	> 0.05
2	No multicollinearity problem	*Variance inflation factor* Gvpro: 4.15; prodino; 3.39; rd: 2.13; cult: 3.14; fgvc: 3.12; coinfr: 2.98; pyinfr: 2.93; netw: 2.69; mrktd: 2.38; fina: 2.35; dedu: 2.23; bgvc: 2.18; gvsupo: 2.01; marko: 1.99; procino: 1.99; pedu: 1.62; inter: 1.54; tax: 1.07	< 5.00
3	Residuals are normally distributed	*Shapiro-Wilk W normality test* z: 3.995 p-value: 0.042	> 0.01
6	No influential observations	*Cook's distance* no distance is above the cut-off	< 1.00

Table 1: Descriptive statistics

Variable	Obs	Mean	Std	Min	Max	Percentiles		
Global value chain						5%	50%	95%
In-output structure	400	0.11	0.18	0.04	1.00	0.01	0.04	0.42
Geographical scope	400	0.46	0.29	0.01	1.00	0.07	0.45	0.95
Product innovation	400	0.51	0.28	0.00	1.00	0.10	0.47	1.00
Process innovation	400	0.46	0.27	0.02	1.00	0.08	0.43	0.95
Forward participation	400	0.28	0.10	0.09	0.63	0.12	0.28	0.42
Backward participation	400	0.26	0.14	0.03	0.62	0.08	0.26	0.55
EE framework conditions								
Gvt. support	400	4.27	0.93	1.94	7.64	2.98	4.14	5.93
Tax & bureaucracy	400	3.99	0.97	2.13	7.25	2.62	3.85	5.74
Gvt programs	400	4.37	0.87	2.23	6.64	3.15	4.32	5.80
Physical infra	400	6.36	0.87	3.50	8.32	4.80	6.40	7.72
Market dynamics	400	5.07	0.91	2.97	7.38	3.75	5.01	6.73
Market openness	400	4.25	0.67	2.15	6.22	3.18	4.20	5.49
Culture	400	4.76	0.87	2.70	7.33	3.42	4.81	6.18
EE systemic conditions								
Finance	400	4.19	0.74	2.10	6.18	3.07	4.14	5.49
Basic education	400	3.32	0.85	1.87	6.12	2.13	3.17	5.03
Post education	400	4.73	0.78	2.31	6.58	3.38	4.77	6.02
R&D transfer	400	3.90	0.73	1.80	6.22	2.82	3.88	5.18
Networking	400	4.75	3.14	0.30	9.30	1.16	4.61	8.41
Commercial infra	400	5.02	0.70	2.10	7.26	3.87	5.03	6.17

Table 2: EE necessary conditions for GVCs

		Input-Output structure		Geographical scope		Upgrading (*product*)		Upgrading (*process*)		GVC forward participation		GVC backward participation	
	EE conditions	Cons.	Cov.	Cons.	Cov.	Cons.	Cov.	Cons.	Cov.	Cons.	Cov.	Cons.	Cov.
Framework cond.	gvsupo	0.84	0.20	0.67	0.76	0.69	0.86	0.71	0.81	0.79	0.61	0.81	0.61
	tax	0.79	0.21	0.62	0.79	0.62	0.87	0.65	0.82	0.81	0.70	0.76	0.73
	gvpro	0.88	0.18	0.77	0.73	0.77	0.80	0.79	0.75	0.72	0.70	0.79	0.74
	pyinfr	0.82	0.15	0.86	0.67	0.86	0.74	0.88	0.69	0.83	0.60	0.85	0.68
	mrkd	0.88	0.18	0.69	0.67	0.71	0.76	0.74	0.72	0.69	0.71	0.65	0.74
	mrko	0.70	0.17	0.81	0.72	0.80	0.79	0.82	0.74	0.68	0.54	0.87	0.61
	cult	0.82	0.18	0.68	0.70	0.70	0.80	0.69	0.72	0.84	0.62	0.87	0.71
Systemic cond.	fina	0.85	0.16	0.75	0.67	0.73	0.73	0.76	0.69	0.83	0.58	0.73	0.64
	bedu	0.71	0.20	0.57	0.78	0.56	0.84	0.58	0.79	0.87	0.64	0.77	0.62
	pedu	0.86	0.15	0.81	0.66	0.80	0.72	0.81	0.66	0.87	0.59	0.88	0.67
	r&d	0.88	0.18	0.78	0.76	0.77	0.83	0.81	0.79	0.71	0.54	0.83	0.61
	netw	0.84	0.17	0.74	0.72	0.74	0.80	0.78	0.76	0.84	0.62	0.81	0.67
	coinfr	0.88	0.15	0.85	0.69	0.82	0.74	0.85	0.70	0.79	0.62	0.75	0.65

Note: *EE*, entrepreneurial ecosystems; *GVC*, global value chain; *gvsupo*, government support, policies and regulations; *Tax*, taxes and bureaucracy; *gvpro,* government programs; *pyinfr*, physical infrastructures; *mrkd,* market dynamics*; mrko*, market openness; *cult,* cultural support and norms; *fina,* finance; *bedu,* basic education; *pedu,* post-education; *r&d*, research & development transfer; *netw,* networking; *coinfr,* commercial/support infrastructures.

Table 3: FsQCA results- Configurations for GVC (input-output structure and geographical scope)

		Input-Output structure						*Geographical scope*			
	EE cond.	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
Framework cond.	gvsupo	●	⊗	●	●	●	⊗	⊗	●	●	●
	tax	●	⊗	●	●	⊗	⊗	⊗	●	●	●
	gvpro	●	⊗	●	●	●	●	⊗	●	●	●
	pyinfr		●		●	⊗		●	●	●	●
	mrkd		●	⊗	⊗	●	●	●		●	●
	mrko	●	●	●	⊗	●	●	●	●	●	●
Systemic cond.	cult	⊗						●	⊗	●	●
	fina		⊗	⊗	●	⊗	●	⊗	⊗	⊗	●
	bedu	●	●	●	⊗	⊗	●	●		●	●
	pedu	●		●	●	●	●	●	●	●	●
	r&d	●			●	●	●		●	●	●
	netw	⊗		⊗				⊗			●
	coinfr	●	●	●	●	●	●	●	●	●	●
	Raw cov.	0.679	0.604	0.642	0.598	0.702	0.643	0.346	0.410	0.402	0.513
	Unique cov.	0.021	0.015	0.038	0.011	0.044	0.048	0.141	0.179	0.151	0.185
	Cons.	0.262	0.263	0.265	0.266	0.272	0.265	0.847	0.893	0.877	0.898
	Overall cons.	0.79						0.88			
	Overall cov.	0.22						0.67			

Table 4: FsQCA results- Configurations for GVC (upgrading as product and process innovations)

		Product Upgrading				*Process Upgrading*				
	EE cond.	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**5**
Framework cond.	gvsupo	●	●	●	●	●	●	⊗	●	●
	tax	●	●		●	●	⊗	●	●	●
	gvpro	●	●	●	●	•	•	⊗	•	•
	pyinfr		●		•	●	●	●	●	●
	mrkd		⊗	⊗	⊗	●	●	⊗	⊗	⊗
	mrko	●	⊗	●	●	●	●	⊗	⊗	●
	cult									
Systemic cond.	fina		●	⊗	•		⊗	⊗	●	
	bedu	●	⊗	⊗		●	⊗	⊗	⊗	
	pedu	●	●	●	●	•	•	⊗	●	•
	r&d	●	●	●	●	●	●	●	●	●
	netw				•					
	coinfr	●	●	●	●	●	●	●	●	●
	Raw cov.	0.464	0.399	0.463	0.497	0.503	0.364	0.390	0.417	0.457
	Unique cov.	0.234	0.133	0.129	0.241	0.132	0.123	0.110	0.109	0.104
	Cons.	0.927	0.920	0.910	0.935	0.941	0.870	0.876	0.891	0.906
	Overall cons.			0.810		0.92				
	Overall cov.			0.820		0.81				

Table 5: FsQCA results- Configurations for GVC (forward and backward participations)

		Forward participation			*Backward participation*		
		1	**2**	**3**	**1**	**2**	**3**
Framework cond.	gvsupo	⊗	●	●	●	●	●
	tax	●	●	●	•	⊗	•
	gvpro	⊗	●	●	●	●	●
	pyinfr	●	●	●	●	●	●
	mrkd	⊗	⊗	●		●	
	mrko	⊗	⊗	●		●	●
	cult	⊗					
Systemic cond.	fina	⊗		●	•	•	•
	bedu	⊗	⊗	•	⊗	•	
	pedu	⊗	●	•	●	●	●
	r&d	⊗	●	•	●	●	●
	netw	●	●	●			
	coinfr	●	●	●	●	●	●
	Raw cov.	0.510	0.535	0.581	0.473	0.495	0.514
	Unique cov.	0.113	0.108	0.107	0.103	0.141	0.121
	Cons.	0.868	0.868	0.874	0.848	0.823	0.855
	Overall cons.	0.89			0.84		
	Overall cov.	0.73			0.79		

Unravelling the entrepreneurial ecosystem conditions spurring the global value chains: A configurational approach

Abstract

Purpose: Despite the popularity of the entrepreneurial ecosystem (EE) concept, research on its value-adding activities receives less attention. Thus, in this article, the authors investigate the role of EEs in supporting global value chain (GVC) activities.

Design/methodology/approach: The authors employ the fuzzy-set qualitative comparative analysis (fsQCA) technique to identify practical configurations of EE's framework and systemic conditions spurring GVC activities in 80 countries.

Findings: The findings suggest different configurations of EE`s framework and systemic conditions necessary for various GVC activities regarding input-output structure, geographical scope, upgrading, and forward and backward participation.

Originality: This study contributes to the extant literature by pioneering the EE approach in explaining GVC development. Moreover, the findings provide novel insights for understanding the entrepreneurial ecosystem—global value chain interplay. As a result, the study offers a more nuanced understanding of how the entrepreneurial ecosystem supports global value chain activities.

Keywords: Entrepreneurial ecosystems, Global value chain participation, Internationalisation, Innovation, Fuzzy-set QCA

Paper Type: Research Paper

1. Introduction

The recent rapid developments in information and communication technologies and the deregulation of cross-border trade and investment have altered how companies operate and compete in international markets. Not only have these advancements enabled firms to fragment and disperse their production activities internationally across various geographical settings (Ambos *et al.*, 2021), but they have also been vital for improving firms' efficiency and giving rise to global value chains-GVCs (Kano *et al.*, 2020). GVCs involve a series of value-adding development stages that a product or service goes through before it is ready for use (Kano *et al.*, 2020). A firm can participate in GVCs if it engages in at least one of the value-adding activities, such as research and development, production, assembly, and distribution (Antràs, 2020). The spreading of the different stages of producing a single product across other firms in different countries highlights the importance of inter-firm relationships.

Scholars consider GVCs' benefits at different levels, such as firm, country, and global. GVCs boost firms' international competitiveness while also increasing their profitability and sustainability. For instance, a firm may undertake complex production stages in advanced economies with highly skilled labour and perform labour-intensive production activities in developing countries to benefit from lower costs and economies of scale. GVCs are potent drivers of productivity and job creation, increasing living standards (Kano *et al.*, 2020). Countries participating in GVCs import skills and technology contribute to economic growth and development (Antràs, 2020; Baglioni *et al.*, 2020). Furthermore, GVCs allow participatory countries to leap-frog their development process. Khorana et al. (2022) depict that at least two-thirds of global trade occurs within GVCs due to intra-country input-output linkages whereby the

output from an operation in one country forms part of the input for the production process in another country.

Over the past two decades, scholars have emphasised the importance of GVC in international trade (Kano et al., 2020). GVCs are characterized by different dimensions, namely, geographic scope, upgrading, input-output structure, and participation. Governance structure explains how firms control the value chain (Choksy et al., 2022; Pla-Barber et al., 2021), while geographic scope explains the global dispersion of the industry and the countries in which different GVC activities are conducted (Antràs and De Gortari, 2020). Upgrading describes the dynamic movement within the value chain (Ambos et al., 2021), while the input-output structure refers to transforming raw materials into final products (Kano et al., 2020). Participation reflects a country's link to GVCs for production and exports (Brumm et al., 2019; Tian et al., 2022). Such GVC activities are embedded and evolve within entrepreneurial political and socio-economic environments (Kano *et al.*, 2020), also known as an entrepreneurial ecosystem (EE) (Bendickson *et al.*, 2021; Lechner *et al.*, 2022). Therefore, EEs—the combination of elements and actors fostering productive entrepreneurship (Jones and Ratten, 2021), act as a designated space for GVCs. With that regard, GVC activities are nowadays conducted across multiple EEs, thanks to advancements in globalisation.

EEs, provide a conducive and fertile milieu for the firms involved in GVC activities. For instance, firms can easily upgrade their products and services in the contexts (ecosystems) that spur innovation (Kansheba 2020). A well-functioning EE is characterised by dense networks of entrepreneurs, investors, advisors, and other critical actors with a culture that encourages networking and connecting (Spigel and Harrison, 2018). Such flow of resources facilitated by EE

actors makes it easier for entrepreneurs and their related firms to engage in GVCs effectively. EEs comprise various elements and actors whose continuous interactions and interdependence are critical to the ecosystem's success (Stam and Van de Ven, 2021). These elements (eco-factors) include human capital, finance, leadership, intermediaries, markets, knowledge, institutions, networks, infrastructure, and talent. Stam (2015) further classified the EE elements into the framework and systemic conditions fundamental for value creation in EEs. Consequently, the interaction and interdependence of both EE framework and systemic conditions are pivotal to the functioning of GVC activities. Despite their relevance, research on how EEs support GVCs still needs to be explored and developed.

Furthermore, several scholars have emphasised the importance of EEs in shaping and spurring entrepreneurial activities (Bendickson *et al.*, 2021; Lechner *et al.*, 2022). However, while GVC activities are also considered entrepreneurial activities, the two major concepts (GVCs and EEs) are often studied in isolation, failing to highlight the link between the two. Consequently, when discussing GVCs and EEs, policymakers and practitioners are left without sufficient evidence to guide their decision-making. It is, therefore, critical to investigate the links between GVC and EEs to inform academia, policymakers, and practitioners. As a result, the authors believe that emphasising this link will advance research at the intersection of these two concepts. The authors set out to answer the following question: *how do entrepreneurial ecosystems support global value chains?* Specifically, the authors explore possible configurations of the EE framework and systemic conditions necessary for spurring various forms of GVC activities.

The paper provides four contributions. First, it examines how various EE conditions affect the primary GVC dimensions—input-output structure, geographic breadth, upgrading, and GVC

participation (Reis *et al.,* 2022). Previous research at the macro-level has looked chiefly at different drivers of GVC growth, including economic factors, cultural values, customer traits, 3D printing technologies, and blockchain technologies (MacCarthy et al., 2016; Griffith and Myers, 2005; Funk et al., 2010; Laplume et al., 2016; Treiblmaier, 2018). Second, there is a lack of a unifying theory for empirical investigations since the GVC theory has been criticised for its complexity and wide range of applications (Kano *et al*., 2020). Furthermore, Opoku-Mensah (2023) and Neilson et al. (2018) draw attention to the dearth of empirical research examining the theory's robustness, validity, and generalisability across various value chains.

Understanding the interrelationships between EEs and GVCs is therefore crucial for refining the theory of the GVC paradigm and advancing knowledge of the connections. Third, the authors conduct a cross-country examination of the EE-GVC linkages. This approach to studying GVC is considered relevant because it studies the phenomenon at hand by considering the heterogeneity of GVCs across countries and context conditions (Kim and Kang, 2023). Fourth, the authors employ a novel fuzzy-set qualitative comparative analysis (fsQCA) method to identify the precise EE conditions that give rise to GVC developments (Douglas et al., 2020). The technique suggests that GVCs cannot be explained by a single "standalone" EE condition but by combining systemic and framework conditions. Thus, the authors identify a variety of EE condition configurations for each GVC activity.

The remainder of this paper is as follows: the next section focuses on the study's theoretical framework, which reviews the literature on GVCs, EEs and the interplay between EE conditions and GVC dimensions. Section three provides for the methodology. The authors present the findings

in section four, followed by the discussion in section 5. The last section documents the conclusion, implications, and potential avenues for further research.

2. Theoretical framework

2.1 Global value chains

For decades, international production sharing was regarded as a component of international trade in which countries imported manufactured goods to include in their exports. However, reducing trade barriers and technological advancements has created opportunities for fragmenting the production processes at an international level. Ambos et al. (2021) pointed out further that two essential features of the contemporary economy have been the globalisation of production and trade, which contribute to the growth of industries, particularly in several developing countries. As a result of this globalisation, more firms are deciding to fragment their production processes by offshoring parts or components of goods to producers in distant countries. The typical 'made in', which indicates which country produces which goods, is now a thing of the past since most goods are "made in the world" (Antràs, 2020), all thanks to GVC, an essential feature of globalisation.

GVC is the set of value-added activities undertaken by economic actors to bring a product or service to end users, with two or more production stages taking place in another country (Kim and Rosendorff, 2021). GVCs also include pre- and post-production activities before and after the production process. Pre-production activities include research and design, while post-production activities can include marketing and distribution (De Marchi *et al.*, 2020). Firms in different countries participating in the production process are considered essential actors in the GVCs (Kim and Rosendorff, 2021). It further highlights the critical value that other countries have in producing goods and services while also highlighting the interdependence, interactions, and interconnections

between countries (Antràs, 2020). Compared to international trade, which focuses on importing and exporting activities between two countries, GVCs involve cross-border production processes among multiple countries.

As previously stated, firms are the focal point in GVCs. Participation in GVC does not imply that firms are trading goods across borders; instead, firms are linked to value chain activities through the value creation process. Although not new in developed countries, fragmentation and internationalisation of production processes have only recently spread to include developing and emerging economies. Small firms in these regions can participate in global production activities without mastering all the technological and managerial skills required to create a product (González-Serrano *et al.*, 2021). Alternatively, they concentrate solely on specific aspects of value chains in which they are most competitive (Wang et al. 2021).

While GVCs are essential to participatory economies, they also have negative consequences, such as environmental pollution (Antràs, 2020) and increased inequality (Kano *et al.*, 2020), especially in regions where chain activities require skilled labour. Notably, employment is skewed to only experienced individuals, leaving a more significant portion of the population unemployed. Furthermore, developing countries are disadvantaged in GVCs due to poor technology compared to developed countries (Kim and Rosendorff, 2021). As a result, some aspects of chain activities are only available to developed countries, resulting in trade disparities between developed and developing countries. The GVC dynamics depend on political and socio-economic environments where value chain activities occur. Among others, these environments include changes in legal and regulatory frameworks and local business institutions, which are thought to positively or negatively impact GVCs (Kano *et al.*, 2020). However, research into how exactly

these environments support GVC activities is scarce and underdeveloped, hence the focus of this research.

2.2 Entrepreneurial ecosystems

The metaphor EEs originates from two lineages, the regional and strategy literature. Both have common roots in the ecological systems as the interdependence between actors in a specific setting (Acs *et al.*, 2017). The regional entrepreneurship development literature focuses on the socio-economic performance differences across regions, e.g., the productivity levels or levels of innovations across different areas. Thus, attention is paid to firm agglomeration and the availability of knowledge institutions, among other things (Szerb *et al.*, 2019). For example, in a region with multiple firms concentrated in one specific location, knowledge spillovers may increase entrepreneurial performance compared to regions with a concentration of few or no firms. Furthermore, areas with high levels of human capital will likely outperform regions with little or no skilled labour. In the strategy literature, EEs emerge as a type of economic coordination in which a firm's success depends on internal/external factors and actors who provide complementary resources (Acs *et al.*, 2017).

Despite its scholarly and policy attention, the EE phenomenon still needs a unified (generally accepted) definition. For instance, Spigel (2017, p. 49) posits that ecosystems are the union of "localized cultural outlooks, social networks, investment capital, universities, and active economic policies that create environments supportive of innovation-based ventures". On the other hand, Stam and Van de Ven (2021, p. 810) define entrepreneurial ecosystems as a "system that produces successful entrepreneurship, and where there is successful entrepreneurship, there is a good entrepreneurial ecosystem". It is important to note that, despite various definitions of what

EEs are, they all have one thing in common: they all focus on creating a conducive environment for entrepreneurial activities. EEs consist of different interrelated and coordinated elements that promote entrepreneurship. EE literature groups these elements into systemic and framework conditions that holistically enable productive entrepreneurial activities (Stam, 2015).

The systemic conditions are the heart of the EE, including networks, finance, human capital (talent, knowledge) and support services (Stam and Van de Ven, 2021). Networks facilitate the exchange of information and resources among entrepreneurs in the EEs (Fernandes and Ferreira, 2022). Networks between entrepreneurs could be more vigorous in developing countries, as they rely on informal networks, than in developed countries with formal solid network ties (Cao and Shi, 2021). Such a difference explains why some EEs are more productive than others. The availability of fund providers in EEs, such as banks, seed and angel investors, and venture capitalists, is critical for entrepreneurial activities (Miles and Morrison, 2020). Universities and research institutes are also vital, as these institutions are the primary source of human capital (talent and knowledge) (Audretsch *et al.*, 2019; Lux *et al.*, 2020). Support infrastructure such as mentors, advisers, and other intermediaries (accountants and lawyers) can reduce entry barriers in EEs and facilitate new value and venture creation.

The framework conditions, on the other hand, include institutional environment (government policies and regulations and leadership), cultural support, market (demand, market dynamics and openness) and physical infrastructure (Stam, 2015). The institutional environment in EEs, such as the formal and informal institutions, government rules and regulations, and leadership, tends to be the guiding principles for entrepreneurs. EEs with conducive institutional environments enable entrepreneurs to identify opportunities, launch and successfully operate their ventures

(Fuentelsaz *et al.*, 2019; Khlystova *et al.*, 2022). Therefore, the quality of the institutional environment will either encourage or discourage entrepreneurial activities.

Culture is a significant factor that influences the entrepreneurial process, and it is thought to be formal and informal institutions that govern entrepreneurial activity across regions (Spigel, 2013). The multiple facets of entrepreneurial culture include entrepreneurial values that promote entrepreneurial spaces and practices, identity, experiences, and dynamic capabilities, as presented in the framework developed by (Donaldson, 2021). Despite its relevance, more than a supportive entrepreneurial culture is needed to ensure long-term entrepreneurial development; a combination of resources such as talent, networks, and risk capital is crucial to sustaining entrepreneurial activities (Spigel and Harrison, 2018). Furthermore, EEs can only be sustainable if there is market access for goods entrepreneurs produce (Kansheba 2020). Compared to urban areas, the need for more access to markets and customers in rural areas has been identified as a constraint to productive entrepreneurship (Miles and Morrison, 2020). Physical infrastructure is also a crucial ingredient and differentiating factor between urban and rural EEs. For example, EEs in rural areas are less developed, which inhibits entrepreneurial activities compared to EEs in urban areas with well-developed infrastructure.

2.3 The interplay between the EE conditions and global value chains

The relationship between EE conditions and GVC can be observed through the lens of complexity theory. Multinational corporations heavily involved in GVC are arguably among the most complex organisations (Sharma et al., 2022). Despite its novelty, the approach has been utilised more extensively in management (Eppel and Rhodes, 2018) and organisation science research (Bohórquez Arévalo and Espinosa, 2015) than in international business research. Using complexity

theory in social systems comprehends dynamic processes that were difficult to describe using existing equilibrium models (Beinhocker, 2006). The theory suggests that high-symmetric relationships between variables are rare, and the goal of science should be an accurate prediction of outcomes under specific conditions rather than focusing on the directionality of relationships or the importance of (individual) independent variables in multiple regression analysis (Woodside et al., 2017). A similar argument holds for the interaction between EE and GVC; in this example, GVC dimensions are best understood by investigating how holistically EE conditions in a holistic (configurational) fashion, rather than individual conditions, impact the GVC activities (González-Serrano et al., 2021). Thus, it is impossible to identify such interactions (configurations) by employing conventional linear models to demonstrate the relevance of relationships between EE conditions and GCV dimensions per complexity theory. While there is a dearth of literature on how EE conditions holistically influence GVC activities, existing literature provides evidence of the novelty of the configuration/holistic approach to studying how the former influences different outcomes. Prior studies have employed the configuration approach to demonstrate the impact of EE conditions on various aspects, including business growth (Torres & Godinho, 2022), the quantity and quality of regional entrepreneurship (Xie et al., 2021), individuals' inspirations to engage in entrepreneurship (Ali et al., 2019), and sustainable entrepreneurship (Huang et al., 2023). These studies provide evidence of a paradigm shift towards a holistic examination of how EE conditions affect other aspects, which aligns with EE systemic functioning.

Based on complexity theory, the study postulates how EE's systemic and framework conditions influence the different dimensions of GVCs: input-output structure, geographical scope, upgrading, and GVC participation. Because of the significance of this phenomenon to the global economy, the literature on macro-level causes of GVC configurations has been progressively

increasing. Previous research has examined the effects of various macro-factors on GVC, including economic variables like labour cost and supply, markets, and competition (MacCarthy et al., 2016). Several additional factors, including the cultural values of the nation (Griffith and Myers, 2005), consumer cultural features of the host country (Funk et al., 2010), 3D printing technologies (Laplume et al., 2016), and blockchain technology (Treiblmaier, 2018), have also been studied as drivers of GVC. The present research adds to the body of knowledge on the macro-level factors that influence GVC by emphasising EE conditions such as the accessibility of money, human resources, and R&D facilities in encouraging GVC configurations within countries. The following is a discussion of the theoretical underpinnings of the interlinkages between each GVC dimension and general EE conditions.

2.3.1 Input-output structure

A value chain comprises the input-output processes that take a product from conception to the end user. The GVC input-output structure shows the flows of intangible and tangible goods and services that are important in tracking the value added at each value chain stage (Kano *et al.*, 2020). Due to the fragmentation of production into different stages, a firm may participate in one stage of the value chain or be responsible for several value-adding activities along the chain (Antràs, 2020). Thus, it may obtain inputs from various countries, while its outputs are sold as inputs for other chains or as final products to end users at home or abroad (Baglioni *et al.*, 2020).

Each stage in the value chain may require specific systematic and/or framework conditions of EEs to be completed. For instance, research and development (R&D) activities are significant inputs in the value chain. R&D is fundamental in GVCs because it provides valuable knowledge for improving existing chain activities (or stages) and developing new products and services that

can compete in international markets (Spigel, 2017). EEs inhabit human capital— individuals` combination of skills, knowledge, and experience (Stam and Van de Ven, 2021). Universities and research institutions have been lauded for being the primary source of human capital (talent and knowledge). They provide the workforce training required by existing and startup firms (Audretsch *et al.*, 2019). Graduates of these institutions possess innovative and creative abilities, which are required for R&D activities in GVCs. Therefore, firms will locate in EEs with universities and other learning institutions to access the human capital necessary for their R&D activities.

2.3.2 Geographical scope

The geographical scope (internationalisation) dimension focuses on the global dispersion of an industry and the different countries where specific value-added activities are taking place (Antràs and De Gortari, 2020). It is further associated with the international splitting of value chain activities and how value is created by different actors across different locations (De Marchi *et al.*, 2020). It also emphasises the transaction cost mechanisms, such as outsourcing production activities, as the primary driver of value creation in GVCs (Siaw and Okorie, 2022). In addition, the interconnectedness of firms in the value chain enables the flow of resources across different geographical settings. Networks are the mechanisms by which different firms in other regions interact (Tian *et al.*, 2022) and thus facilitate the exchange of resources between firms and countries.

2.3.3 Upgrading

GVC upgrading refers to the process by which economic actors, nations, firms, and workers move from low-value to relatively high-value activities to increase the benefit of participating in global production networks (Gereffi, 2019). It has also been associated with product, process, and function (upgrading) innovation activities (Kano *et al.*, 2020). Firms may use more efficient technologies to

convert inputs to outputs (process upgrading) or switch to a new product line (product upgrading). Firms may also choose to discontinue certain functions or acquire new value-added functions (functional upgrading), or they may choose to enter a new but related industry (sectoral upgrading) (Fernandez-Stark and Gereffi, 2019).

For successful upgrading activities, various skills, access to finance, entrepreneurial culture, and government policies are crucial (Reis *et al.*, 2022). As a result, regions with the presence of universities that can provide the necessary skills and financial providers (Miles and Morrison, 2020) will find it much easier to add economic value to their products through upgrading than regions lacking talent and financial capital. Furthermore, regions characterised by supportive entrepreneurial cultures such as risk-taking, proactiveness, and innovation (Stuetzer *et al.*, 2018) are likely to engage in higher value-adding activities than other regions. In addition, regions with entrepreneurial-friendly government policies and entrepreneurial support services such as insurance and consulting services may encourage firms to shift from low-value-added to higher-value-added activities. All these propositions align with Ambos et al. (2021), who posit that different government policies and strategies, available technology and skilled labour play a critical role in upgrading success.

2.3.4 GVC participation

The GVC participation entails how much a country is linked to GVCs for its production and exports (Kano *et al.*, 2020). A country participates in GVC by purchasing foreign inputs for use in the producing goods and services it exports (backward participation) or by exporting locally manufactured inputs to foreign partners for use in production (forward participation). Therefore, backward participation refers to the proportion of imported value added to produce domestic

exports. In contrast, forward participation refers to the ratio of domestic value added to a foreign partner's export (Tian *et al.*, 2022).

Two main factors influence GVC participation—policy and non-policy factors. Regarding policy factors, regions with favourable government policies encouraging entrepreneurial activities, such as low taxes on raw material imports, will encourage backward participation. However, areas with high import tariffs (on inputs) will discourage backward participation while encouraging forward participation (Reis *et al.*, 2022). Therefore, backward GVC participation encourages upgrading by enabling some regions to source sophisticated inputs from other countries for their higher-level value-adding activities (Tian *et al.*, 2022). For non-policy factors, the infrastructural development of regions also tends to influence GVC participation rates. Areas with well-developed infrastructure (both physical and economic), such as manufacturing factories, airports, railways, motorable roads, and telecommunications systems, will be well-positioned to participate backward in GVCs since the available infrastructure can enable the production of exports locally. Furthermore, market dynamics impact both forward and backward GVC participation (Tian *et al.*, 2022). Regions with high demand for locally produced goods but no supporting infrastructure, such as manufacturing plants, will likely be involved in forward GVC activities and vice versa.

3. Methods

3.1 Data and sample

The sample comprised 400 observations from 80 countries. The dataset is compiled from two major global databases, the Organisation for Economic Cooperation and Development (OECD) and Global Entrepreneurship Monitor (GEM), organised by the Global Entrepreneurship Development Institute (GEDI).

3.2 Variable operationalisation

FsQCA involves two types of variables: conditions and outcomes. First, the authors consider GVC in-output structure, geographical scope, (product and process) upgrading, and (forward and backward) participation as the study's main outcomes. In addition, the entrepreneurial ecosystem`s framework (government support and policies, tax and bureaucracy, government programs, physical infrastructure, market dynamic and openness, and culture) and systemic (finance, basic and post-education, R & D transfer, networking, and commercial infrastructure) conditions were further considered as conditions.

Input-Output structure: According to Gereffi (2019), the input-output structure represents the value added under different stages of a value chain, such as input supply, production, distribution, and marketing. It also describes the participants (actors) who engage in those stages and how their interactions with one another result in the delivery of goods and services to customers (Reis *et al.*, 2022). Thus, the authors adopt the OECD country`s total value-added indicator, which reflects the value generated by producing goods and services, measured as the value of output minus the value of intermediate consumption (OECD, 2022).

Geographical scope: This refers to the geographic distribution of value chain activities regarding how firms engage with and integrate other firms, suppliers, and customers regionally, nationally, or internationally (Kano *et al.*, 2020). Gereffi (2019) argued that the phenomenon could also be associated with the internationalisation focus (activities) of upstream and downstream companies in the context of multinational businesses. Consequently, the authors adopted the GEDI internationalisation indicator, which captures the extent of countries` internationalisation as the

exporting potential of their companies while controlling the extent to which the country can produce complex products.

Upgrading: Upgrading dimension of GVC describes how companies and regions can enhance their managerial and technological capabilities to participate in more value-adding stages in a chain (Ambos *et al.*, 2021). Companies usually spark upgrading activities by creating more effective and creative production processes (process upgrading) or competitive and innovative products (product upgrading). Thus, the authors employ GEM`s product and process innovation indicators as the measures of product and process upgrading activities. According to Kansheba (2020), product innovation represents a country's potential to generate new products and adopt or imitate existing ones. It is also referred to as technology and innovation transfer (whether a business environment allows the application of innovations for developing new products). Furthermore, GEDI refers to process innovation as a country's potential to apply and/or create new technology (as the percentage of businesses whose principal underlying technology is less than five years old) (Kansheba and Wald 2022).

Forward GVC participation refers to the "seller" or "supply" side of GVC participation. It estimates the domestic value added in inputs sent to "third economies" to undergo further processing and export through supply chains. This occurs when intermediate goods or services are exported to a partner economy, which re-exports them to a third economy. The degree of a country's forward GCV participation is determined by the share of its domestically produced inputs in third countries' exports (Khorana *et al.*, 2022). It is calculated as the ratio of domestic value added (to other countries) to the country's aggregate gross exports (World Trade Organisation, 2019).

Backward participation refers to the "buyer" or "demand" side of GVC participation. It estimates the value of foreign value-added content, i.e., from imported intermediate goods and services in the economy's total exports. The magnitude of backward GVC participation in an economy is reflected in its reliance on foreign inputs to produce its exports (Khorana *et al.*, 2022). It is calculated as the ratio of foreign value-added content of exports to the economy's total gross exports (World Trade Organisation, 2019).

EE framework and systemic conditions: Stam and Van de Ven (2021) described EE conditions (elements) in terms of framework and systemic conditions. The framework conditions include the social (informal and formal institutions), physical, and market conditions enabling or constraining human interaction. On the other hand, systemic conditions include networking, leadership, finance, talent, knowledge and (commercial infrastructure) support services. Stam (2015) regarded framework conditions as the fundamental causes of value creation in the EEs. This author further viewed systemic conditions as the heart of the EE, as their presence and interactions predominantly determine the ecosystem's success. Thus, the authors employ the following GEM indicators for the abovementioned conditions.

Seven indicators represent the framework conditions. 1) *Government support and policies*: the extent to which public policies support entrepreneurship—entrepreneurship as a relevant economic issue. 2) *Taxes and bureaucracy:* the extent to which taxes or regulations are either size-neutral or encourage new ventures and SMEs. 3) *Government programs*: the presence and quality of programs directly assisting SMEs at all levels of government (national, regional, municipal). 4) *Physical infrastructure:* ease of access to physical resources such as communication, utilities, transportation, land, or space at a price that does not discriminate against SMEs. 5) *Market*

dynamics: the level of market change from year to year. 6) *Market openness:* the extent to which new firms can enter or exit the existing markets. 7) *Culture:* 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.

On the other hand, the systemic conditions were presented by six indicators. 1) *Finance*: the availability of financial resources such as equity and debt for small and medium enterprises (SMEs) (including grants and subsidies). 2) *Basic education*: the extent to which training in creating or managing SMEs is incorporated within the education and training system at primary and secondary levels. 3) *Post education:* 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/universities, etc. 4) *R & D transfer*: the extent to which national research and development will lead to new commercial opportunities and is available to SMEs. 5) *Networking*: essential networking potential of a possible entrepreneur as the percentage of the population who personally knows an entrepreneur who started a business within two years. 6). *Commercial and professional infrastructure*: property rights, commercial, accounting, and other legal and assessment services and institutions that support or promote SMEs.

Before further analyses, the authors performed different data reliability tests whose results proved the dataset reliable (see Appendix 1). Table 1 provides the descriptive results of the employed sample.

*****Insert Table 1 here*****

3.3 Data analysis

The authors used a fuzzy-set qualitative comparative analysis (fsQCA) method to analyse the data. Its main emphasis is that potential combinations of conditions significantly impact a given outcome more than any single (stand-alone) condition (Eng and Woodside, 2012). As a result, the fsQCA considers several strategies (approaches) to get a particular outcome. The fsQCA requires the dataset to be transformed into the log-odds metric, with all values between 0 and 1. However, Ragin (2018) cautioned further that the precisely 1 and 0 membership thresholds (breakpoints) would correspond to positive and negative infinity, respectively, for the log of odds. Thus, instead of using the 0 and 1 membership scores range, the authors followed Pappas and Woodside (2021) suggestions and considered 0.05, 0.5, and 0.95 thresholds (breakpoints) for data calibration. The first value (0.05) considers an observation entirely outside the set (non-membership). The second value (0.50) assumes a midpoint, neither inside nor outside the set (crossover point). Finally, the third value (0.95) considers the observation entirely inside the set (full membership). Similar thresholds have been utilised by other studies (e.g., Wang et al. (2022).

The authors used the 5%, 50%, and 95% percentile computation to determine which values in their dataset correspond to the 0.05, 0.5, and 0.95 (see Table 1). They used these values as the three breakpoints for data calibration in fsQCA software. After data calibration, the authors performed the necessity and sufficiency tests to evaluate the effect of the different EE conditions on GVC dimensions. The authors first performed a necessity test. Pappas and Woodside (2021) document that a condition is necessary when it must always be present in the occurrence of a particular outcome. Thus, consistency, in this case, denotes how well the condition can forecast a

specific result. According to González-Serrano et al. (2021), for a condition to be considered necessary, its value should be ≥ 0.90.

The authors then performed the sufficiency analysis of the conditions. In calculating the sufficiency conditions, the fsQCA analysis consists of two stages (Wang et al. 2022). First, a truth table algorithm transforms the scores in a fuzzy data set into a truth table that lists all logically possible combinations of causal conditions and the empirical result of each configuration. Second, fsQCA produces three possible solutions: complex, parsimonious, and intermediate. The complex solution provides all the possible combinations (configurations) of conditions, and then traditional logical operations are applied. However, its complexity arising from many configurations (solutions) makes its interpretations impractical (Pappas and Woodside, 2021). Thus, the complex solutions are simplified into parsimonious and intermediate solution/configurational sets.

The parsimonious solution presents the most important "core" conditions that cannot be omitted from any configuration. Unlike a complex solution, the parsimonious solution includes any counterfactual combination for logical and simplified configurations. The intermediate solution is generated by performing counterfactual analysis on the complex and parsimonious solutions, including only theoretically plausible counterfactuals (Pappas and Woodside, 2021). The conditions eliminated in the parsimonious solution, and appearing only in the intermediate solution are referred to as "peripheral conditions". Therefore, merging the parsimonious and intermediate solutions offers a more detailed and aggregated view of the findings (Wang et al., 2022). Thus, the authors highlighted the intermediate solution by identifying the "core" conditions (those appearing in both parsimonious and intermediate solutions) and "peripheral" conditions (those that appear only in the intermediate solutions).

Finally, the critical advantage of fsQCA over conventional variance-based approaches such as linear multivariate analysis, cluster analysis, ANOVA, and MANOVA is worth mentioning. Variance-based approaches often evaluate variables` net effects in a competitive environment, focusing on the effect of individual variables. In contrast, fsQCA focuses on the intricate and asymmetric relationships between the outcome of interest and its antecedents/conditions (González-Serrano *et al.*, 2021). Consequently, fsQCA is popularised as an adequate tool for understanding complex social phenomena as clusters of interrelated conditions, such as entrepreneurial ecosystems and their impact on GVC (Kraus *et al.*, 2018). For instance, under the variance-based approaches (e.g., correlation, regressions) that assume linear (symmetrical) relationship among variables, it can be concluded that high government interventions (e.g., supports and programs) lead to high GVC upgrading (product and process innovation) activities, and the vice versa.

However, under complexity and configuration theories, high GVC upgrading activities are likely to exist even when government interventions are low (absent), suggesting that the condition is sufficient but unnecessary. Also, sometimes high (presence) of government interventions may lead to high GVC upgrading activities only when a third condition is present or absent (high or low) (e.g., quality physical and commercial infrastructures, R & D). Thus, the use of fsQCA becomes an ideal technique for this study as it enables the authors to capture the conditions that are not only sufficient or necessary to explain the outcome but also those that are insufficient on their own but are necessary parts of the effective configurations in explaining the outcome. The authors used fsQCA 3.0 software to perform these configurational analyses.

4. Results

4.1 Necessary and sufficient conditions

Results in Table 2 show that no single EE (standing alone) condition is necessary for explaining the GVCs as none of the conditions has a consistency exceeding 0.90, as recommended by prior studies (González-Serrano *et al.*, 2021).

*****Insert Table 2 here*****

Furthermore, results in Tables 3, 4, and 5 confirm that the fsQCA models are adequate, informative, and valid as under all dimensions of GVC, the overall configurational (solution) consistencies are above 0.80 (Wang et al. 2022), except for input-output structure. Thus, all identified EE conditions' configurations are sufficient for supporting the GVC activities except for the input-output structure. The fsQCA produces three different coverage scores to gauge the ability of the configurations to capture real-world scenarios. The overall solution coverage scores are above 50%, meaning the identified configurations holistically explain most GVC instances except for the input-output structure. Raw coverage entails the empirical relevance of each configuration by indicating how much it explains the outcome.

In contrast, unique coverage demonstrates the relative importance of each configuration by removing overlapping elements (Kraus *et al.*, 2018). The results indicate the presence of several equifinality configurations suitable for various settings, as seen by the raw and unique coverage of each configuration exceeding 10%. Moreover, to obtain a minimum (meaningful) number of observations (cases) for the assessment of the configurations, the frequency (i.e., the number of observations for each possible configuration) thresholds is set. While a higher frequency threshold indicates that each combination (configuration) refers to more observations in the sample and thus

reduces the sample coverage explained by the retained configurations, a lower frequency threshold indicates fewer observations (cases) in the sample but increases its coverage.

Ragin (2018) and Fiss (2011) recommended a frequency threshold of 3 (or higher) for samples larger than 150 cases and a frequency threshold of 2 for smaller samples. As the study sample is 400, the authors set the frequency thresholds at three and removed all combinations with smaller frequency from further analysis. The authors also set the consistency thresholds (the strength of the superset or subset relationship) at 0.8, which corresponds with (an alternative measure of the consistency) proportional reduction in inconsistency (PRI) value of 0.5 and above as recommended by Pappas and Woodside (2021). The PRI measures how the observed cases can be explained by the logical relationships between the conditions of the explanatory (input) and outcome (output). PRI can also be used to evaluate the model's goodness of fit.

4.2. Identification of effective configurations

The results revealed various configurations of EE conditions that can explain (induce) the GVC dynamics, as shown in Tables 3, 4, and 5. The authors found four configurations (solutions) that explain 67% of the cases of the *geographical scope* of GVC (overall consistency and coverage of 88% and 67%, respectively). The most explanatory (raw coverage of 51%) is the combination of the presence of high (core) levels of physical infrastructure and post-school education, the presence of low (peripheral) levels of government support and policies, tax and bureaucracy, government programs, market dynamics and openness, culture, finance, basic-school education, R&D transfer, networking, and commercial (support service) infrastructure. The second most explanatory (raw coverage of 41%) differs from the first by the presence/absence of market dynamics, basic-school education, networking, and the core/peripheral absence of finance and culture. The third most

explanatory (raw coverage of 40%) slightly differs from the first by the presence/absence of networking and core absence of finance. The least explanatory (raw coverage of 34.6%) differs from the first by the presence/absence of R&D transfer, peripheral absence of government support and policies, tax and bureaucracy, government programs, networking, and the core absence of finance.

*****Insert Table 3 here*****

The authors further found four configurations explaining 82% of the cases of *product upgrading* (overall consistency and coverage of 81% and 82%, respectively); see Table 4. The most explained one (raw coverage of 49.7%) is the combination of the presence of high (core) levels of government support and policies, tax and bureaucracy, government programs, market openness, R&D transfer, low (peripheral) levels of physical infrastructure, finance, post-school education, networking, commercial (support services) infrastructure, presence/absence of culture, basic-school education, and peripheral absence of market dynamics. The second most explanatory (46.4%) slightly differs from the first by the presence/absence of physical infrastructure, market dynamics, culture, finance, and networking. The third (46.3%) and fourth (39.9%) differ from the first by the peripheral absence of market openness, finance, and basic-school education. Moreover, all identified configurations share the same high levels of physical infrastructure, post-school education, and commercial (support services) infrastructure.

The results further show five configurations explaining 81% of the cases of process upgrading (overall consistency and coverage of 92% and 81%, respectively). The most explained configuration (50.3%) is the combination of the presence of high levels of government support and policies, tax, physical infrastructure, market dynamics and openness, basic-school education, R&D transfer, low levels of government programs, post-school education, commercial infrastructure, and

the presence/absence of culture, finance, and networking. The next (45.7%) slightly differ from the first by the presence/absence of basic-school education and peripheral absence of market dynamics. Finally, the rest of the configurations vary from the prior two by the mix of core/peripheral absence of various EE conditions, as shown in Table 4. Notably, all five configurations share the same aspects of high levels of physical infrastructure, R&D transfer, and low-level commercial (support services) infrastructure.

*****Insert Table 4 here*****

Table 5 provides the set of configurations for GVC *forward and backward participation*. The authors found three configurations under each, explaining 73% (consistency: 89%) and 79% (consistency: 84%) of forward and backward participation (coverage of 73% and 79%, respectively). The most explained configuration (58.1%) under forward participation is the combination of the presence of high levels of government support and policies, tax and bureaucracy, government programs, physical infrastructure, market dynamics and openness, finance, low levels of basic and post-school education, R&D transfer, networking, commercial infrastructure, and the presence/absence of culture. The second most explained configuration (53.5%) differs from the first by the peripheral absence of market dynamics, openness, and basic-school education. Finally, the least explained configuration (51%) differs from the most explained one by consisting of several conditions identified as either core/peripheral absent, with only tax, physical and commercial infrastructure, and networking being either core/peripheral present.

The configurational results also reveal three related (with slight differences) configurations explaining GVC backward participation. The most explained configuration (51.4%) shows that both EE framework and systemic conditions are crucial for supporting GVC backward

participation. Specifically, government support and programs, physical infrastructures, market openness, post education and R&D have been identified as core conditions, while taxes, finance, and commercial infrastructures are peripheral conditions. Moreover, the results show the peripheral absence of some conditions (e.g., taxes and basic education), meaning that they do not influence (support) backward participation. See configurations 1 and 2.

*****Insert Table 5 here*****

To assess the robustness of fsQCA, the authors reperformed the analyses by setting new mid- (cross-over) calibration membership breakpoints at the 45th (-0.1) and the 55th (+0.1) percentile, following Wang et al. (2022). The authors also edited the truth tables by raising the consistency threshold from 0.80 to 0.90 (Pappas and Woodside, 2021). The two processes can also be used to identify substitutable conditions, if any exist (i.e., overlapping conditions with similar contributions to the outcome under study). The presence (existence) of substitutable conditions helps the researchers better comprehend the intricacy of the relationships between conditions and outcomes. The fsQCA results robustness check revealed marginal (insignificant) changes in overall solution consistencies. New configurations did not deviate from the original ones, suggesting the absence (no evidence) of meaningful substitutable conditions. The authors explain the possible circumstances for the lack of evidence for conditions' substitutability in this study under the discussion section.

5. Discussion

While GVC activities occur in EEs, more research should be conducted on how EEs support GVCs. The findings of this study indicate that no standalone EE condition can be used in explaining GVCs. Instead, the study finds four configurations of EE conditions necessary for the *geographical scope*

of GVCs, indicating that different combinations of EE conditions can explain why a firm decides to locate a specific stage of its manufacturing in a particular region. However, the authors emphasise the most explanatory configurations of EE conditions, which include a combination of the presence of high (core) levels of physical infrastructure and post-school education and the presence of low (peripheral) levels of government support and policies, tax and bureaucracy, government programs, market dynamics and openness, culture, finance, basic-school education, R&D transfer, networking, and commercial (support service) infrastructure. As provided by Audretsch et al. (2019) and Miles and Morrison (2020), firms tend to locate their production stages mostly in regions with the presence of physical infrastructure (e.g., highways, railways, and telecommunication networks) and knowledge institutions such as universities and research hubs. Learning and research institutions facilitate knowledge creation and transfer within EEs and thus generate skilled and talented graduates who can complete GVC production activities.

The study further reveals four configurations of EE conditions explaining *upgrading* activities in GVCs. These are concerned with how firms or regions transition from low-value-added activities to relatively high-value-added activities to maximise their benefit from participating in GVCs production stages (Kano *et al.*, 2020). The authors, however, stress the most explanatory configuration of EE conditions, which includes physical infrastructure (mentioned in the geographical scope), high levels of government support and policies, tax, market dynamics and openness, basic-school education, and R&D transfer. Thus, these factors should be considered in addition to the other conditions mentioned earlier. Implementing entrepreneurship-friendly policies and programs, such as lowering market entry barriers for new firms and providing financial assistance to entrepreneurs, encourages firms and regions to engage in upgrading activities.

Furthermore, governments and businesses must invest in R&D facilities to spur innovations (upgrading) in different areas. Prior research also suggests that EEs have rules, regulations, and support programs to assist start-ups and high-growth ventures in innovating (upgrading) their products and services (Stam and Van de Ven, 2021). Furthermore, EEs that in-house universities and research institutions that spur entrepreneurial creativity and innovation are crucial in supporting GVC upgrading activities.

The study also reveals three configurations of EE conditions linked to forward and backward participation. The most described configuration for forward participation in GVCs includes the combination of high levels of government support and policies, tax and bureaucracy, government programs, physical infrastructure, market dynamics and openness (mentioned earlier in the geographical scope and upgrading dimension) and finance. This indicates that in addition to the other conditions mentioned previously, the presence of financial resources (such as equity and loan facilities) within a region will encourage that region to engage in forward participation in GVCs. Finance is crucial for the growth and survival of entrepreneurial ventures (Stam and Van de Ven, 2021). These findings align with prior evidence, which indicates that EEs with a pool of angel investors, venture capitalists, investors, and other funding institutions (Miles and Morrison, 2020) that may provide access to loans will have firms that take part in forward participation in GVCs. Since GVC activities are entrepreneurial activities, these findings also back up previous research, which indicates that markets, government support, physical infrastructure and finance are essential elements that positively impact entrepreneurial activities (Stam, 2015; Stam and Van de Ven, 2021).

The configurational findings show that both systematic and framework conditions of EE support GVC backward participation. The authors stress the most explained configuration, which

is a combination of core conditions of government support and programs, physical infrastructures, market openness (explained in forward participation), post education and R&D. Therefore, in addition to the combination of conditions necessary for forward participation, to engage in backward participation, regions need to focus on incorporating training and skill development programs into the curriculum of higher education institutions so that the population can acquire the necessary skills to participate in GVCs. Also, regions with well-established research facilities will be able to identify new opportunities compared to areas lacking such facilities. In line with these findings, several studies report that entrepreneurial ecosystems are natural habitats for such entrepreneurship-focused support programs, higher institutions of learning and research facilities (Audretsch *et al.*, 2019; Stam, 2015; Stam and Van de Ven, 2021) and thus well-suited in supporting backward participation in GVCs.

While it is useful when applying the fsQCA to identify substitutable conditions for practical implication flexibility, the results' robustness assessment did not reveal their existence in the studied dataset. Lack of non-substitutability of the conditions can be due to two reasons. The first reason is the conditions' distinctness and their non-overlapping contributions. In certain instances, the variables under investigation possess inherent uniqueness where no other circumstances can replicate their effects. The authors investigate the impact of intricate phenomena (the EE) whose components (conditions) have unique and crucial influence on the outcome (GVC). The second (and the most vital) reason is the existence of complex and non-linear relationships between the studied variables. In such a situation, configurations depend on complex interactions or synergetic effects that are impossible to replace.

There are several reasons to support the non-linear relationship between EE conditions and GVC activities. For instance, positive government initiatives, such as support and subsidies, can entice companies to participate in GVC operations due to lower initial entrance barriers and motivation for interacting with international partners. However, overzealous government actions may result in declining results. Businesses that depend too much on government assistance may put immediate profits ahead of sustained competitiveness. This could discourage GVC upgrading efforts and breed complacency. While funding is essential, its excess might not entail increased (improved) GVC involvement. Businesses that occasionally have easy access to excessive funding might not prioritise GVC engagement in favour of domestic expansion or less hazardous endeavours.

Moreover, a surplus of funds may cause businesses to misallocate resources by funding projects that do not advance value chain integration. Also, overfunding can potentially cause firms to become risk-averse by emphasising asset protection over risk-taking in GVC activities. Similarly, a sufficient talent and human capital supply can boost GVC upgrading efforts at first. However, yields may diminish if a skills mismatch or the talent supply exceeds the demand. In these situations, companies might not make the most of the talent on hand, which could result in underemployment and a shift in emphasis toward internal or non-GVC-related tasks.

Non-linearity between EE conditions and GVC activities can be further evident through market dynamism and openness. Companies may give local markets more importance than international ones because of the prospects found in a vibrant and open domestic market. On the other hand, a decline in market openness and dynamism may lead to a rise in the GVC input-output structure. Businesses may go to international markets to maintain growth when home markets

stagnate. Similarly, more R&D expenditures may cause the GVC input-output structure to contract. Companies might devote more funds to R&D, emphasising product innovation more than participating in various GVC activities.

Conversely, a decline in R&D operations can result in a rise in GVC forward participation. Businesses may participate in GVC to gain access to new markets and technology if they have limited resources for innovation. Lastly, the non-linear relationship can be evident through the impact of dynamic networking and collaboration. Extensive local (domestic) collaborations and networks might eliminate the need for external networks emanating from GVC engagement. However, enterprises may look for external collaborations within the GVC to access resources and competencies if there is not enough domestic collaboration.

6. Conclusion

6.1 Theoretical implications

Research on the role of EEs in GVCs is underdeveloped and scarce (Reis *et al.*, 2022), even though GVCs and their activities are embedded within EEs. As such, this study significantly contributes to this scarcity by providing an early exploration of the interplay between the EEs` framework and systemic conditions and GVCs activities using fsQCA. Also, this study offers a novel theoretical contribution to the EE literature and GVCs by identifying different configurations and combinations of EE elements that support the development of GVC activities in terms of input-output structure, geographical scope, upgrading, and GVC participation. Furthermore, the study contributes to complexity theory by explaining the complex relationships and links between EE systemic and framework conditions and different GVC activities. The study also contributes significantly to the entrepreneurship literature by emphasising the vital role EEs play in developing entrepreneurial

activities, such as various activities undertaken in the different stages of GVCs. Finally, the study contributes to and extends the literature on the intersection of EE conditions and GVC activities, emphasising the need to study the two concepts in tandem and not in isolation.

6.2 Practical implications

The study has implications for both entrepreneurs and policymakers. For entrepreneurs, locating their businesses should be guided by preliminary research to determine whether the local or regional conditions are favourable. This includes looking for regions with easy access to EE systemic (finance, talent, networks) and framework (support, infrastructure, culture, markets) conditions. Prior research has shown that GVC contributes to participating nations` economic growth and development (Baglioni *et al.*, 2020; Kano *et al.*, 2020). It is also important to note that governments may only join GVCs if their EEs are (healthy) conducive enough. As a result, policymakers in various EEs are encouraged to create policies promoting entrepreneurial activity, spur GVC activities, and lead to more economic growth and development. Also, governments and businesses should invest in developing infrastructure and implementing entrepreneurship-friendly policies to encourage regions and firms to participate in GVCs.

It is also important to emphasise that while GVC improves economic efficiency, production, and employment while also increasing the availability of intermediate products (Kano *et al.*, 2020), deglobalisation would harm countries that participate in GVC (Gopalakrishnan *et al.*, 2022). As a result, policymakers are encouraged to create efficient and effective economic structures and infrastructure, dependable institutions, strategic partnerships, networks, and efficient human capital capable of attracting international investment even in the face of deglobalisation, ensuring economic development and growth. Furthermore, policymakers should act as gatekeepers and establish dependable and efficient national political systems and trade relationships

with neighbouring countries, as this will facilitate the flow of goods and services, finances, and human capital in the event of deglobalisation, which may become a constraint for participation in GVC.

Furthermore, policymakers should provide a stable regulatory environment and constantly re-evaluate their policies to ensure that they are entrepreneurship-friendly, as this may also encourage the development of entrepreneurial ventures in their jurisdiction while attracting international businesses. Policymakers could also promote the formation of relationships between potential entrepreneurs and companies involved in various stages of GVC activities, as this could result in the emergence of new entrepreneurial ventures and, as a result, economic development. Further, the authors argue that entrepreneurship training programs should be incorporated into basic and post-graduate education to provide the necessary skills needed by entrepreneurs in creating and managing sustainable ventures that cannot only join but also compete in GVCs. EEs' initiatives should spur startups, scaleups, and high-tech firms to engage in GVCs by developing the necessary skills in these specializations.

6.3 Future research

The study utilizes a fsQCA-based dataset from 80 countries. Despite its superiority over other conventional analytical techniques, the fsQCA does not explore the dynamics embedded in the two studied phenomena. EEs' conditions and GVC activities are dynamic and evolve (Kano *et al.*, 2020). Thus, future research can explore the EEs' and GVC's interplay dynamics. The configurational analyses in this study do not show evidence of the influence of EEs on the input-output structure of GVCs. Future research can explore how various EE conditions impact the input-output activities of the GVCs. Both conceptual and in-depth studies will enrich the understanding of the mentioned gap. The authors' analyses did not incorporate the governance aspect of GVC due

to its operationalisation difficulties. Thus, future research can embark on developing a measurement framework for GVC governance, which will open room for studying its connectedness with EE.

Research indicates that digitalisation shapes the locus of entrepreneurial opportunities and transforms best entrepreneurial practices and activities. As such, future research could explore the impact of digitalisation in shaping the participation of different countries in GVC. This aspect could particularly be explored in developing countries due to their limited involvement in GVCs. Also, the data analysed in this study consisted of 400 observations from 80 countries between 2014 and 2018 sourced from OECD and GEDI databases. This analysis can be done with updated data from these same databases or other databases to find out if the findings of this study have changed or are still relevant—future research can embark on this. Finally, the study focused on specific EE systematic and framework conditions from Stam's (2021) framework, which does not incorporate other vital elements (conditions) such as intermediaries, institutions and leadership. Future research could explore the interplay of these EE elements with GVC activities.

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Appendix A: Data reliability tests

S/N	Assumptions	Test(s)	Seek values
1	No heteroskedasticity problem	*Breusch-Pagan hettest* Chi2(1): 0.003 p-value: 0.958	> 0.05
2	No multicollinearity problem	*Variance inflation factor* Gvpro: 4.15; prodino; 3.39; rd: 2.13; cult: 3.14; fgvc: 3.12; coinfr: 2.98; pyinfr: 2.93; netw: 2.69; mrktd: 2.38; fina: 2.35; dedu: 2.23; bgvc: 2.18; gvsupo: 2.01; marko: 1.99; procino: 1.99; pedu: 1.62; inter: 1.54; tax: 1.07	< 5.00
3	Residuals are normally distributed	*Shapiro-Wilk W normality test* z: 3.995 p-value: 0.042	> 0.01
6	No influential observations	*Cook's distance* no distance is above the cut-off	< 1.00

Table 1: Descriptive statistics

Variable	Obs	Mean	Std	Min	Max	Percentiles		
Global value chain						5%	50%	95%
In-output structure	400	0.11	0.18	0.04	1.00	0.01	0.04	0.42
Geographical scope	400	0.46	0.29	0.01	1.00	0.07	0.45	0.95
Product innovation	400	0.51	0.28	0.00	1.00	0.10	0.47	1.00
Process innovation	400	0.46	0.27	0.02	1.00	0.08	0.43	0.95
Forward participation	400	0.28	0.10	0.09	0.63	0.12	0.28	0.42
Backward participation	400	0.26	0.14	0.03	0.62	0.08	0.26	0.55
EE framework conditions								
Gvt. support	400	4.27	0.93	1.94	7.64	2.98	4.14	5.93
Tax & bureaucracy	400	3.99	0.97	2.13	7.25	2.62	3.85	5.74
Gvt programs	400	4.37	0.87	2.23	6.64	3.15	4.32	5.80
Physical infra	400	6.36	0.87	3.50	8.32	4.80	6.40	7.72
Market dynamics	400	5.07	0.91	2.97	7.38	3.75	5.01	6.73
Market openness	400	4.25	0.67	2.15	6.22	3.18	4.20	5.49
Culture	400	4.76	0.87	2.70	7.33	3.42	4.81	6.18
EE systemic conditions								
Finance	400	4.19	0.74	2.10	6.18	3.07	4.14	5.49
Basic education	400	3.32	0.85	1.87	6.12	2.13	3.17	5.03
Post education	400	4.73	0.78	2.31	6.58	3.38	4.77	6.02
R&D transfer	400	3.90	0.73	1.80	6.22	2.82	3.88	5.18
Networking	400	4.75	3.14	0.30	9.30	1.16	4.61	8.41
Commercial infra	400	5.02	0.70	2.10	7.26	3.87	5.03	6.17

Table 2: EE necessary conditions for GVCs

		Input-Output structure		Geographical scope		Upgrading (*product*)		Upgrading (*process*)		GVC forward participation		GVC backward participation	
	EE conditions	Cons.	Cov.	Cons.	Cov.	Cons.	Cov.	Cons.	Cov.	Cons.	Cov.	Cons.	Cov.
Framework cond.	gvsupo	0.84	0.20	0.67	0.76	0.69	0.86	0.71	0.81	0.79	0.61	0.81	0.61
	tax	0.79	0.21	0.62	0.79	0.62	0.87	0.65	0.82	0.81	0.70	0.76	0.73
	gvpro	0.88	0.18	0.77	0.73	0.77	0.80	0.79	0.75	0.72	0.70	0.79	0.74
	pyinfr	0.82	0.15	0.86	0.67	0.86	0.74	0.88	0.69	0.83	0.60	0.85	0.68
	mrkd	0.88	0.18	0.69	0.67	0.71	0.76	0.74	0.72	0.69	0.71	0.65	0.74
	mrko	0.70	0.17	0.81	0.72	0.80	0.79	0.82	0.74	0.68	0.54	0.87	0.61
	cult	0.82	0.18	0.68	0.70	0.70	0.80	0.69	0.72	0.84	0.62	0.87	0.71
Systemic cond.	fina	0.85	0.16	0.75	0.67	0.73	0.73	0.76	0.69	0.83	0.58	0.73	0.64
	bedu	0.71	0.20	0.57	0.78	0.56	0.84	0.58	0.79	0.87	0.64	0.77	0.62
	pedu	0.86	0.15	0.81	0.66	0.80	0.72	0.81	0.66	0.87	0.59	0.88	0.67
	r&d	0.88	0.18	0.78	0.76	0.77	0.83	0.81	0.79	0.71	0.54	0.83	0.61
	netw	0.84	0.17	0.74	0.72	0.74	0.80	0.78	0.76	0.84	0.62	0.81	0.67
	coinfr	0.88	0.15	0.85	0.69	0.82	0.74	0.85	0.70	0.79	0.62	0.75	0.65

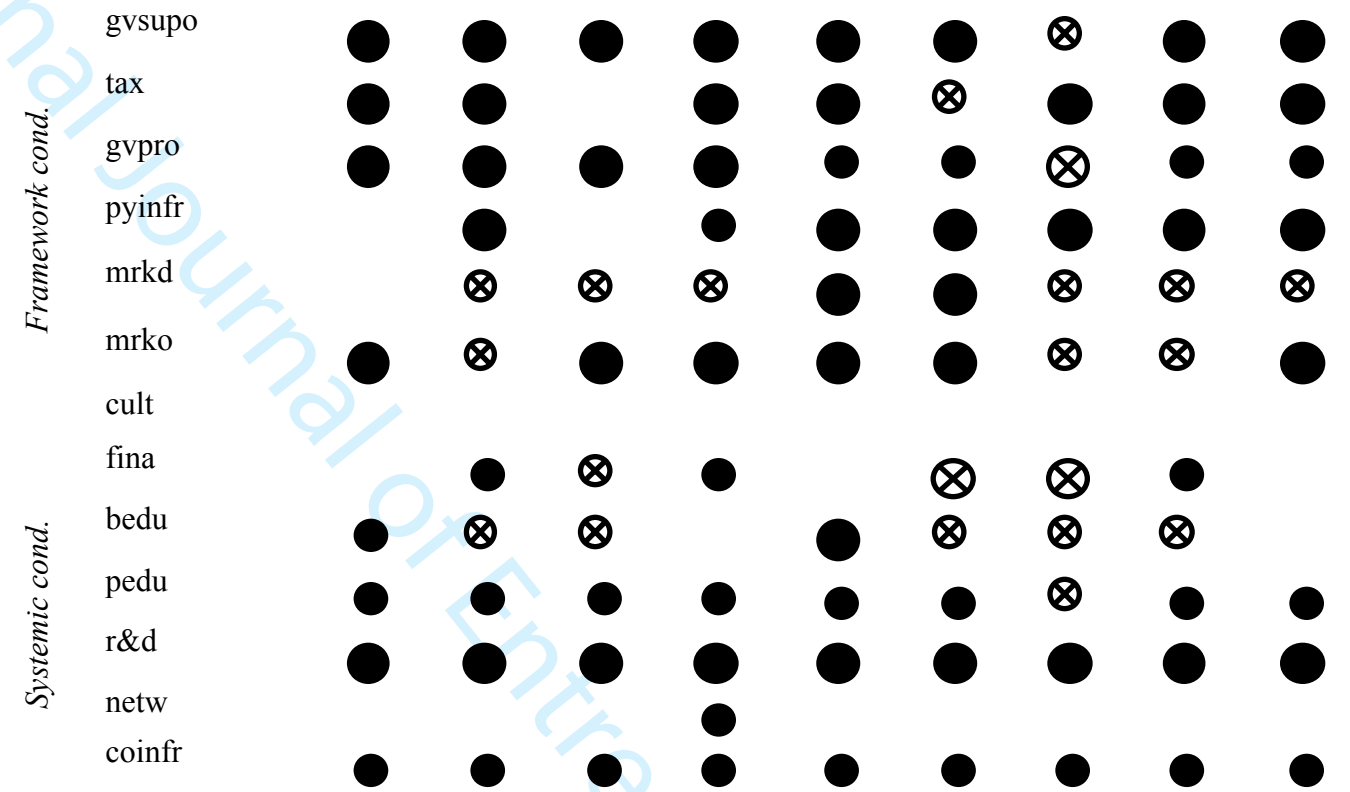
Note: *EE*, entrepreneurial ecosystems; *GVC*, global value chain; *gvsupo*, government support, policies and regulations; *Tax*, taxes and bureaucracy; *gvpro,* government programs; *pyinfr*, physical infrastructures; *mrkd,* market dynamics*; mrko*, market openness; *cult,* cultural support and norms; *fina,* finance; *bedu,* basic education; *pedu,* post-education; *r&d*, research & development transfer; *netw,* networking; *coinfr,* commercial/support infrastructures.

Table 3: FsQCA results- Configurations for GVC (input-output structure and geographical scope)

		Input-Output structure						*Geographical scope*			
	EE cond.	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
Framework cond.	gvsupo	●	⊗	●	●	●	⊗	⊗	●	●	●
	tax	●	⊗	●	●	⊗	⊗	⊗	●	●	●
	gvpro	●	⊗	●	●	●	●	⊗	●	●	●
	pyinfr		●		●	⊗		●	●	●	●
	mrkd		●	⊗	⊗	●	●	●		●	●
	mrko	●	●	●	⊗	●	●	●	●	●	●
Systemic cond.	cult	⊗						●	⊗	●	●
	fina		⊗	⊗	●	⊗	●	⊗	⊗	⊗	●
	bedu	●	●	●	⊗	⊗	●	●		●	●
	pedu	●		●	●	●	●	●	●	●	●
	r&d	●			●	●	●		●	●	●
	netw	⊗		⊗				⊗			●
	coinfr	●	●	●	●	●	●	●	●	●	●
	Raw cov.	0.679	0.604	0.642	0.598	0.702	0.643	0.346	0.410	0.402	0.513
	Unique cov.	0.021	0.015	0.038	0.011	0.044	0.048	0.141	0.179	0.151	0.185
	Cons.	0.262	0.263	0.265	0.266	0.272	0.265	0.847	0.893	0.877	0.898
	Overall cons.	0.79						0.88			
	Overall cov.	0.22						0.67			

Table 4: FsQCA results- Configurations for GVC (upgrading as product and process innovations)

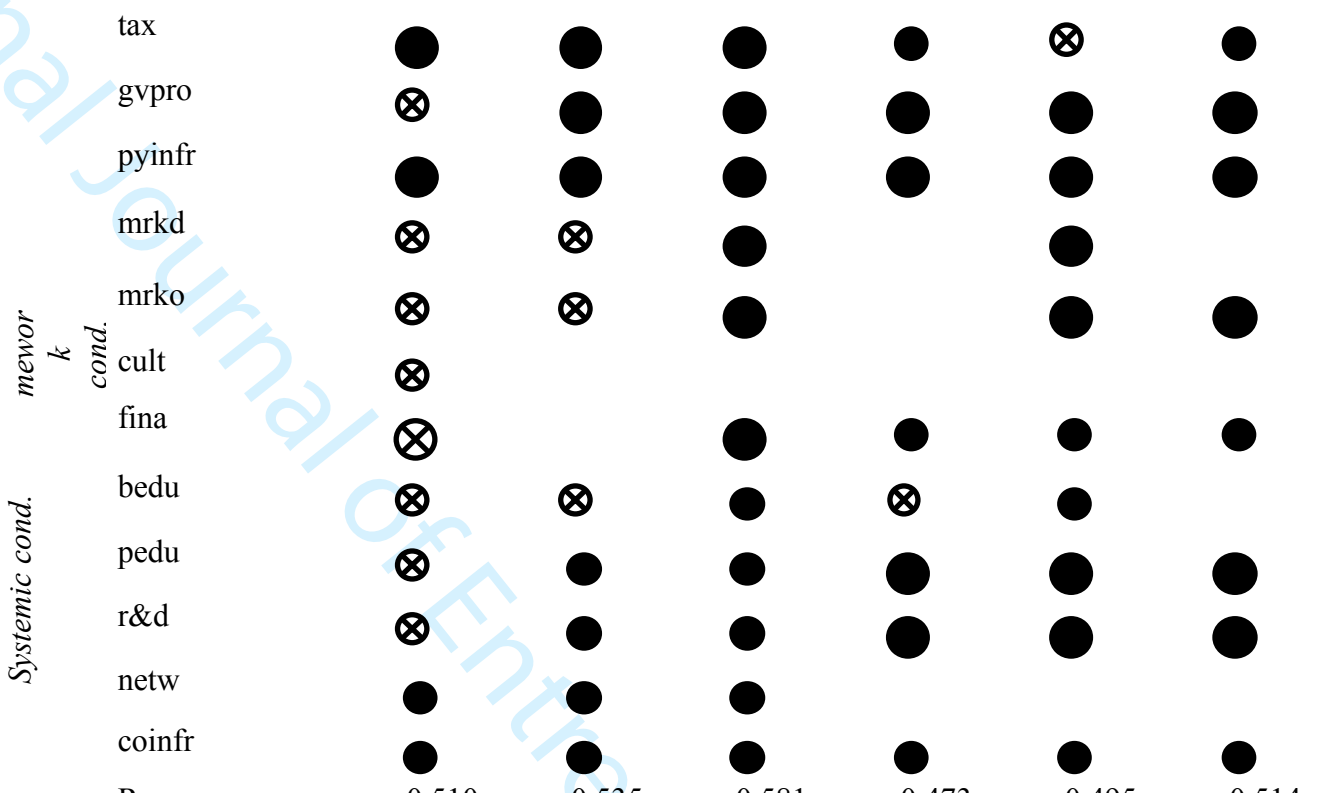
	Product Upgrading				*Process Upgrading*				
EE cond.	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**5**



Raw cov.	0.464	0.399	0.463	0.497	0.503	0.364	0.390	0.417	0.457
Unique cov.	0.234	0.133	0.129	0.241	0.132	0.123	0.110	0.109	0.104
Cons.	0.927	0.920	0.910	0.935	0.941	0.870	0.876	0.891	0.906
Overall cons.			0.810		0.92				
Overall cov.			0.820		0.81				

Table 5: FsQCA results- Configurations for GVC (forward and backward participations)

		Forward participation			*Backward participation*		
		1	**2**	**3**	**1**	**2**	**3**
Fra	gvsupo	⊗	●	●	●	●	●



Raw cov.	0.510	0.535	0.581	0.473	0.495	0.514
Unique cov.	0.113	0.108	0.107	0.103	0.141	0.121
Cons.	0.868	0.868	0.874	0.848	0.823	0.855
Overall cons.	0.89			0.84		
Overall cov.	0.73			0.79		