National Innovation Systems and Global Value Chain Participation: The Role of Entrepreneurship

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Abstract

The national innovation systems (NISs) literature has focused on institutional and industrial structures while overlooking creative individual agencies. This gap may leave unanswered the question of why some countries with weak institutional structures still improve global value chain (GVC) participation. This study, thus, investigates how national entrepreneurial dynamism impacts a country's GVC participation as conditioned by other elements of NISs. The empirical results show that entrepreneurship is positively associated with GVC participation. Additionally, this positive relationship is stronger among countries with lower levels of intellectual property rights (IPR) protection and smaller amounts of R&D employment. The findings suggest that entrepreneurship contributes to a country's GVC participation and helps a country overcome its institutional weaknesses and, thus, achieve better globalization performance. Therefore, the study adds to NISs literature with creative individual agency, reveals the national internal avenue for GVC participation, and enriches the research on the NIS-GVC relationship.

Keywords National innovation systems · Global value chain participation · National entrepreneurial dynamism · Intellectual property rights protection · R&D employment

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Résumé

La littérature sur les systèmes nationaux d'innovation (SNI) s'est essentiellement penchée sur les structures institutionnelles et industrielles, tout en négligeant les agences de création individuelles. Cette lacune peut laisser sans réponse la question de savoir pourquoi certains pays, dont les structures institutionnelles sont faibles, parviennent encore à améliorer leur participation aux chaînes de valeur mondiales (CVM). Ainsi, cette étude examine l'impact du dynamisme entrepreneurial national sur la participation à la CVM au niveau d'un pays, sachant qu'elle est conditionnée par d'autres éléments des SNI. Les résultats empiriques montrent que l'entrepreneuriat est positivement associé à la participation aux CVM. En outre, cette relation positive est d'autant plus forte dans les pays ayant de faibles niveaux de protection des droits de propriété intellectuelle (DPI) et ayant moins d'emplois dans la recherche et développement (R&D). Les résultats suggèrent que l'esprit d'entreprise contribue à la participation d'un pays aux chaînes de valeur mondiales et aide ledit pays à surmonter ses faiblesses institutionnelles et à atteindre ainsi une meilleure performance dans le cadre de la mondialisation. Par conséquent, l'étude vient enrichir la littérature sur les SNI en se focalisant sur l'agence de création individuelle; elle révèle le cheminement interne, au niveau national, qui mène vers la participation aux CVM et enrichit la connaissance sur la relation entre SNI et CVM.

Introduction

Global value chains (GVCs) refer to the full range of activities from design to consumer services that reflect the process of value creation around the world (Ponte et al. 2019). GVCs thus act as conduits of knowledge and offer opportunities for learning and innovation (Gereffi et al. 2005; Humphrey and Schmitz 2002; Morrison et al. 2008). Lead firms in developed countries are regarded as the governors and controllers of the activities along the chain (Ponte and Sturgeon 2014; Strange and Humphrey 2019), and they determine the process and outcome of developing countries' learning and innovation. However, recent work has criticized that prior GVC literature has exaggerated the role of lead firms in influencing the learning and innovation process (Lema et al. 2019), as the absorption capability of developing country suppliers also matters much (Raj-Reichert 2019). *The European Journal of Development Research*'s 2018 special issue "innovation systems in the era of global value chains" enlightens the thoughts on the relationship between 'national innovation systems' (NISs) and GVCs. NISs are defined as "the set of institutions whose interactions determine the innovative performance of national firms" (Nelson 1993). In this context, the notions of learning and innovation shifted emphasis from the governance of lead firms towards the institutional and industrial structures within which those processes are embedded (De Marchi et al. 2018; Haakonsson and Slepniov 2018). A key message was that it is this structure (rather than the governance of lead firms) of emerging economies that ultimately determines their learning and innovation productivity (Fagerberg et al. 2018; Pietrobelli and Staritz 2018). Lema et al. (2018) conclude that NISs coevolve with GVCs, portraying

the interaction between the institutional structure of developing economies and learning and innovation opportunities provided by developed economies.

Despite this progress, previous NIS theories are not sufficient to explain why some economies with weak institutions, policies, and infrastructures still improve GVC participation, which refers to the increase in the domestic value-added ratio (DVAR) measured by the value of exported firms excluding the part produced by imported intermediary products (Kee and Tang 2016; Koopman et al. 2014; Upward et al. 2013). The works of Acs et al. (2014) and Radosevic (2007) have implied that the lack of integrating entrepreneurship into NISs may lead to the aforementioned gap. Specifically, Radosevic (2007) has indicated that there is a missing link between entrepreneurship and NISs. Acs et al. (2014) criticized that the NIS literature hardly ever evokes the term 'entrepreneurship', despite their closely conceptual relation. Integrating entrepreneurship into NISs supplements NISs with individual agency (Hung and Whittington 2011), contributing to the explanation for GVC participation from creative agents and their behavior. In this study, based on the study of Acs et al. (2014), we define national entrepreneurial dynamism, which refers to the vitality of entrepreneurial activities within a country, as the entrepreneurship element of NISs. Additionally, because the elements of NISs interact with each other rather than function separately, we also intend to explore the interaction between national entrepreneurial dynamism and other elements of NISs. Based on the work of Sampath and Vallejo (2018), we focus on the interaction between entrepreneurship and two NISs' capability indicators (i.e., intellectual property rights (IPR) protection and R&D employment). Thus, we intend to examine the following question: *how does national entrepreneurial dynamism affect a country's GVC participation as conditioned by the other elements of NISs (i.e., IPR protection and R&D employment)?*

Based on data from the Global Entrepreneurship Monitor (GEM) and the World Bank, the empirical results illustrate that national entrepreneurial dynamism is positively related to a country's GVC participation, and this positive relationship is stronger among countries with lower levels of IPR protection as well as those with smaller amounts of R&D employment. The findings reveal that entrepreneurship facilitates GVC participation more if the country has weak institutions, policies, or infrastructures. Ultimately, this study makes several contributions to the current literature. First, it enriches the literature on NISs (Lundvall 1992, 1999; Nelson 1993) by emphasizing national entrepreneurial dynamism as an element of NISs, supplementing NISs with individual agency on the basis of its structural standpoint (Acs et al. 2014). Second, it reveals an internal avenue within NISs to improve GVC participation and thus emphasizes the role of entrepreneurship in improving a country's learning and innovation capability. Third, it recognizes some critical boundary conditions under which national entrepreneurial dynamism within NISs matters more when considering its function in improving GVC participation, revealing the substituting role of entrepreneurship in overcoming national structural weaknesses.

Theories

National Innovation Systems and Global Value Chains

GVCs are the newly salient governance structure of the global economy (Fagerberg et al. 2018; Kano et al. 2020; Turkina and Van Assche 2018), involving the process of a firm's participation in globalization to capture value through better learning and innovation capabilities (Buckley 2009; Franssen 2020; Gereffi and Lee 2012; Kano 2018; Laplume et al. 2016; Mudambi 2008). Larger multinational corporations (MNCs) and lead firms in advanced economies actively coordinate the activities within GVCs, achieving their governance role and exerting control impacts on component suppliers in emerging economies. Knowledge and technology could thus be transferred to developing countries (Lema et al. 2019). Subsequent superior innovation performance in developing countries attracts people to explore how business innovation develops through developing value chain linkages (Humphrey et al. 2018; Sun et al. 2010), which provide learning and innovation opportunities for these businesses (De Marchi et al. 2018).

Progress has been made, as current studies have identified that NISs of developing economies impact the learning and innovation opportunities in GVCs. The findings of the NIS-GVC relationship contribute to a shift emphasis from the governance and control of lead firms to institutional and industrial structures within which the absorption capability of firms in developing countries has a critical impact on learning and innovation productivity. In other words, NISs encompass a country's institutions, policies, and infrastructures, which support learning and innovation activities in an economy. Previous studies have indicated that innovation systems contribute to possible GVC participation (Lee et al. 2018; Park and Gachukia 2020), firms' capacity to access and adapt learning from GVCs (Keijser and Iizuka 2018), and profit improvement (Fagerberg et al. 2018; Tajoli and Felice 2018) through supporting transmission, delivery, absorption, and implementation of technology and knowledge (Haakonsson and Slepniov 2018). GVCs also provide learning and innovation opportunities for strengthening NISs (Park and Gachukia 2020). NISs thus coevolve with GVCs (Lema et al. 2018, 2019), implying that elements of the systems coordinate and develop with GVCs.

However, despite this progress, prior NIS literature fails to explain why some countries with weak NISs still improve GVC participation. Some findings imply that the overlook of the role of individual agency (i.e., entrepreneurs) in NISs may lead to this gap (Acs et al. 2014; Hung and Whittington 2011; Mitra 2019; Radosevic 2007). Therefore, this study aims to explore whether and how the entrepreneurship of NISs impacts GVC participation. Additionally, the elements in NISs are interactive. The impact of entrepreneurship on GVCs might interact with other elements of NISs, such as IPR protection and R&D employment (Sampath and Vallejo 2018). This study thus also examines the entrepreneurship-GVC relationship as conditioned by IPR protection and R&D employment.

GVC Participation

GVC participation, which is the cornerstone of GVC research (Amendolagine et al. 2019; Pietrobelli and Staritz 2018; Wang et al. 2019), is closely related to the creation or production of new knowledge (Tan et al. 2019) and economic growth (Jangam and Rath 2020). Although still scarce, available previous studies appear to point to the benefits of GVC participation (Pietrobelli and Rabelloti 2011). For example, GVC participation may help countries to create new job opportunities and achieve faster growth by "by facilitating flows of knowledge, skills, and technology and by creating new market opportunities" (Hagemejer 2018). In addition, GVC participation contributes to the firm performance by favoring learning (Brancati et al. 2017; Mazzi et al. 2021) and thus help to increase aggregate productivity in industries by promoting competition among domestic firms and even improve institutional quality consequently.

Current findings suggest that GVC participation depends on the improvement of DVAR (Kee and Tang 2016; Koopman et al. 2014; Upward et al. 2013). Prior literature has revealed that foreign direct investment (FDI) (Amendolagine et al. 2019; Kee 2015), trade intermediaries, and imported materials (Kee 2015) are critical factors impacting a firm's DVAR (Kee and Tang 2016). However, despite the impacts of these external activities, scant literature explores the avenue for GVC participation from the perspective of country-level internal local activities. As discussed earlier, national entrepreneurial dynamism is an element of NISs, which coevolve with GVCs; thus, we argue that national entrepreneurial dynamism may exert an impact on a country's GVC participation.

Hypotheses Development

National Entrepreneurial Dynamism and GVC Participation

The coevolutionary relationship between NISs and GVCs reveals the interaction between systemic elements such as national institutions, policies, and infrastructures and learning and innovation behaviors within the scope of internationalization and globalization (Lema et al. 2018, 2019). National entrepreneurial dynamism, as another element of NISs, reveals a systemic phenomenon (Acs et al. 2014). Generally, a nation with high entrepreneurial dynamism represents more entrepreneurial individuals and activities within NISs. Entrepreneurship as a process of commercializing entrepreneurial opportunities involves the discovery, evaluation, and exploitation of business opportunities (Shane and Venkataraman 2000). These activities contribute to the deeper use of existing knowledge and the creation of new knowledge, increasing the total amount of knowledge spillover in NISs.

Current findings suggest that GVC participation depends on value creation via economic activities such as new products, services, or markets (Pietrobelli and Staritz 2018), as these activities can contribute to an increase in the DVAR of a firm's exported products (Kee and Tang 2016; Upward et al. 2013). Additionally, efficiency, innovation, and flexibility are identified as the mechanisms of value creation in GVCs (Zhang

and Gregory 2011). We argue that national entrepreneurial dynamism positively affects GVC participation for the following reasons. First, NISs with high entrepreneurship dynamism contribute to enhancing firms' productivity and reducing their production cost, increasing the DVAR of exported products and contributing to GVC participation. Entrepreneurship, on the one hand, facilitates the speed and scope of knowledge spillover (Acs et al. 2009; Braunerhjelm and Svensson 2010) within NISs, contributing to the foundation of technological innovation (Mueller 2006). Advanced technology can simplify the process of product production and achieve better resource allocation, increase firms' productivity, and thus help them reduce production costs. On the other hand, entrepreneurship prompts related institutions and policies to make change, improving the flexibility of NISs. Flexible NISs enable more efficient learning and innovation behaviors to occur (Malerba and McKelvey 2020), helping firms increase productivity and reduce costs.

Second, a high DVAR depends on more domestic intermediary products in the production process, which can be achieved through entrepreneurial activities within NISs that can increase the diversification of domestic products. Entrepreneurship stirs the existing domestic markets, allowing more efficient social resource allocation. The extension of production scope has a heavy reliance on limited resources, while entrepreneurship advances resource efficiency and can help relieve this conflict. Entrepreneurs with heterogeneous knowledge and technology agglomerate together to develop various new combinations (Becker and Knudsen 2002; Malerba and McKelvey 2020), which improve the diversification of domestic intermediate products (Grossman and Helpman 1991) within NISs. Thus, firms can have substituted the choice of imported intermediary products, contributing to the increase in the DVAR of exported products and thus facilitating GVC participation.

Third, NISs with more entrepreneurial dynamism promote competitiveness among domestic firms and improve the quality of domestic products, thus resulting in a substitution in imported intermediary products and increasing the DVAR of exported products. Specifically, entrepreneurship can strengthen the competition between new alternatives and prior products or services, encouraging firms to advance their competitiveness by adopting new technology, conducting efficient resource allocation, and innovating their business model. Population ecology theory states that competition advances survival capability (Hannan and Freeman 1977), which represents the competitive advantage in providing superior and high-quality products. Thus, firms can choose domestic high-quality intermediary products, leading to a reduced need for imported intermediary products. Consequently, the DVAR of exported products can be enhanced, contributing to GVC participation. Therefore, we propose the following hypothesis:

Hypothesis 1 There is a positive relationship between national entrepreneurial dynamism and a country's GVC participation.

The Contingent Role of Other Elements of NISs

The elements of NISs are interactive. Institutions, policies, and infrastructures constitute the structure of NISs, while entrepreneurs complement NISs with creative individual agency (Acs et al. 2014). In recent years, an emerging phenomenon of 'massive entrepreneurship' has occurred in some developing countries, such as China and India (Ahlstrom et al. 2018), which are characterized by weak NIS structures. A plethora of studies have indicated that entrepreneurship contributes to innovation production and economic development (Wang and Tan 2018). The world has indeed witnessed booming entrepreneurship in some developing economies. Therefore, considering the current possible impact of entrepreneurship on GVC participation, this study intends to further explore whether entrepreneurship has helped NISs overcome the weaknesses in structure and thus facilitated the country's GVC participation.

Previous studies have indicated that public R&D investments, scientific publications, and intellectual property payments and patents by residents are national capability indicators (Sampath and Vallejo 2018). Based on this study, we regard public R&D investments and scientific publications as the contents of the infrastructure-specific structure of NISs and take the indicator of R&D employment as its measure. Additionally, we focus on the institution- or policy-specific structure of NISs and adopt the indicator of IPR protection as the measure of it. Therefore, we examine the contingent impact of these two elements on the entrepreneurship-GVC participation relationship.

The Moderating Role of IPR Protection

IPR protection as a regulator-specific institution (Peng et al. 2017a, 2017b) refers to the regulations and rules that can protect and maintain the rights of the owner's intellectual property, playing a critical role in supporting a country's strategic activities, especially innovation activities. We argue that IPR protection in NISs plays a contingent role in the relationship between entrepreneurship and GVC participation for the following reasons.

First, NISs with a high level of IPR protection improve domestic firms' productivity by encouraging more innovation and thus help reduce their cost, facilitating the DVAR of exported products. IPR protection contributes to the advancement of technology, as a well-designed IPR protection regime improves the dissemination of knowledge and information by encouraging more inputs to R&D activities. Specifically, IPR infringement under a strict IPR protection regime involves a heavy cost (Nandkumar and Srikanth 2016; Reitzig and Puranam 2009). Potential punishment is conducive to impeding opportunistic behavior such as copying others' technologies, thus reducing the potential risks when firms conduct innovative activities. Consequently, firms have optimistic expectations about future returns and are attracted to invest more in R&D activities. The whole knowledge spillover can be strengthened, which contributes to process innovation. Thus, innovation is beneficial to the domestic firm's efficiency and productivity and helps reduce the cost of

the production of domestic products. The DVAR of exported products can thus be increased, resulting in the country's GVC participation.

Second, the developed IPR protection regime in NISs not only attracts firms from advanced countries to invest or create new ventures in domestic firms but also encourages domestic incumbents or new ventures to conduct innovation activities, increasing the diversification of the production of domestic firms. Prior literature has revealed that superior IPR protection can protect innovation outcomes (Young et al. 2018). Superior IPR protection sends a signal that R&D investments or financial expenditure can avoid risk from malicious plagiarism. Therefore, firms have the willingness and confidence to conduct more innovation production activities. Consequently, more innovation activities enhance the diversification of products of domestic firms, increasing the DVAR of exported products. Thus, the country can improve GVC participation.

Third, a well-designed IPR protection regime in the NISs provides firm production with great competitiveness, as agglomerated innovation enhances the quality of the production of domestic products, consequently contributing to the improvement of the DVAR of the exported products. Specifically, reasonable IPR protection enables more innovation to be produced. Innovation spillover positively impacts the whole process of product production. In particular, the quality of domestic products can be strengthened because of more improvement achieved in the production process through innovation spillover. Consequently, the exported products can rely more on domestic intermediary products, reducing the need for imported intermediary products. Therefore, the DVAR of exported products increases, contributing to GVC participation.

Overall, superior IPR protection within NISs positively impacts GVC participation, substituting the dependence of GVC participation on entrepreneurship. Therefore, we propose the following hypothesis:

Hypothesis 2: The positive relationship between national entrepreneurship dynamism and GVC participation will be stronger among countries with a lower level of IPR protection in NISs.

The Moderating Role of R&D employment

R&D employment refers to workers who conduct R&D activities, to some extent representing the R&D structure of NISs (Sampath and Vallejo 2018). R&D has proven to be the channel of the local creation of knowledge and the creation of local value-added (Kim and Lee 2015; Lee et al. 2018), implying that a large amount of R&D employment usually creates a strong foundation for a country's R&D activities. We argue that R&D employment in NISs plays a contingent role in the relationship between entrepreneurship and GVC participation for the following reasons.

First, a high density of R&D employment in NISs implies a talent agglomeration effect, which helps facilitate the spread of knowledge transfer, improving domestic firms' productivity and thus increasing the DVAR of exported products. Specifically, a large pool of R&D employment, which develops the structure of NISs, contributes to the agglomeration of knowledge and technology. The talent pool helps shorten the

distance between different R&D employments, promoting learning and innovation behaviors. Additionally, the mobility of R&D employment stimulates firms' innovation through knowledge transfer (Kaiser et al. 2018). The NISs thus provide a solid foundation for domestic firms' productivity improvement and subsequently help increase the DVAR of exported products.

Second, NISs with more R&D employment improve the possibility of combining different knowledge and technology, facilitating the diversification of domestic product production, which increases the DVAR of exported products. More R&D employment with various backgrounds helps improve the heterogeneity of R&D employment. The heterogeneous knowledge released from R&D employment enables different combinations to instruct product production. Therefore, the diversification of domestic products can be improved. Domestic exported firms can have a wider scope for the choice of intermediary products, leading to less dependence on imported intermediary products. Consequently, the DVAR of exported products increases, helping the nation improve GVC participation.

Third, R&D employment in NISs competes with each other and thus eventually improves their capability, which helps firms produce high-quality domestic products, increasing the DVAR of exported products. Previous studies have revealed the importance of R&D in strengthening national competitiveness. For example, Sun et al. (2010) indicate that R&D can help firms in emerging economies increase their competitiveness and strengthen NISs, as R&D activities enable advanced technology to use in the process of product production. In addition, R&D employment with superior capabilities can attract complex trade, which has a heavy dependence on knowledge-intensive employment. Direct evidence is from the study of Gereffi and Fernandez-Stark (2010), which indicates that the "increasingly sophisticated knowledge-intensive process being offshored and outsourced".

Overall, the high level of R&D employment within NISs positively impacts GVC participation, substituting the dependence of GVC participation on entrepreneurship. Therefore, we propose the following hypothesis:

Hypothesis 3: The positive relationship between national entrepreneurship dynamism and GVC participation will be stronger among countries with a smaller amount of R&D employment in NISs.

Methods

Sample and Data

The independent variable (*national entrepreneurial dynamism*) of this study draws from the Adult Population Survey (APS) of GEM, which is a dataset covering global longitudinal data on the entrepreneurial activity of multiple sample countries (Reynolds et al. 2005). This indicator tracks the emergency or registration of new self-employment or new firms within a given population, acting as an output measure of country-level entrepreneurship (Acs et al. 2014). We matched the data from GEM with data from the World Bank, World Economic Forum, and UIBE-GVC

indicators. After transforming the data into balanced panel data, we were left with a sample of 180 observations, which includes 20 countries for 2006–2014. Table 1 shows the specific countries. However, there are missing values, leaving a relatively small sample size for us to empirically test our hypotheses.

Variables and Measures

Dependent Variables

GVC participation. It is measured by the increase in average production length (Wang et al. 2017), referring to the domestic value-added ratio in exports (Koopman et al. 2014; Ndubuisi and Owusu 2021). Specifically, the average production length is "the average number of times that the value-added created by the production factors in a country sector has been counted as gross output in the sequential production process" (Wang et al. 2017, p. `3). The greater the value of the domestic exported products is, the higher the degree of GVC participation.

The research institute for GVCs at UIBE provides the raw results of the GVC participation based on 43 countries/regions with 56 sectors. The measurement results are sector specific, but this study would depend on country-level data. Therefore, based on the raw data of the World Input–Output Database, we calculate the weight of each sector of a country in every specific year. Combining the measurement results from UIBE and the weight of every sector, we can calculate the country-level GVC participation index.

Predictors

National entrepreneurial dynamism. It is measured using the ratio of the number of self-employed workers and new firms to the size of the population (Reynolds et al. 2005) and taken from the *total entrepreneurial activity (TEA) rate* of GEM, with the specific item "the proportion of people who are currently involved in business start-up at the age between 18 and 64". It reflects the entrepreneurial dynamism in a specific country/region and functions as an indicator of NISs (Acs et al. 2014).

IPR Protection. Following the study of Belderbos et al. (2013), we investigate the impacts of IPR protection using its measure from the World Economic Forum. It is scored as a continuous variable from 1, denoting weak protection, to 7, representing the world's most stringent level of protection (l. IntelPro): "How would you rate intellectual property protection, including anti-counterfeiting measures, in

Table 1 The sample countries

Argentina	Croatia	Japan	Slovenia
Belgium	Finland	Netherlands	Spain
Brazil	France	Norway	United Kingdom
Chile	Greece	Peru	United States
Colombia	Hungary	Russian Federation	Uruguay

your country? [1 = very weak; 7 = very strong]". It reflects the level of the regulatory institutional environment under which various strategic activities are supported.

R&D employment. R&D employment is measured by using the number (per million people) of researchers who conduct R&D activities. It is taken from the *Science & Technology* of the World Bank. It reflects the level of resource endowment a country/region has.

Controls

Country-level controls are obtained from the World Bank.

High-technology exports. High-technology contains high DVAR (Miller and Temurshoev 2017). The export activities of high technology impact a country's DVAR of other exported products.

The total number of listed domestic companies. The listed domestic companies attract more investments around the world to support more advanced production activities. They have an impact on export activities.

GDP. The high level of GDP reveals that a country has the ability to conduct more R&D activities, helping release more innovation. These good outcomes contribute to facilitating productivity, diversification, and quality, which are impetuses for GVC participation.

Revenue excluding grants. The revenue indicates the value added in a country acquiring from production and trade activities. The high revenue supports more DVAR acquired from product production.

Merchandise imports. Merchandise imports reveal the degree of international trade, having an impact on the DVAR of exported products. Thus, it can affect GVC participation.

Analysis and Results

Main Effects and Moderation Effects

Table 2 presents the means, standard deviations, and correlations for all variables. A multicollinearity test using variance inflation factor (VIF) analysis (Meyers et al. 2016; Neter et al. 1985) shows that the VIFs are within the acceptable range (from 1.34 to 4.57), with a mean value of 2.89, below the benchmark of 10 (Cohen et al. 2003; Neter et al. 1985). Therefore, we believe the risk of multicollinearity biasing our results is within acceptable limits.

Additionally, to avoid the negative impact of multicollinearity (Aiken and West 1991), the independent variable and moderating variables are centered before they are constructed into an interaction term.

Table 3 shows the results of the effect of national entrepreneurial dynamism on a country's GVC participation and the contingent role of IPR protection and R&D employment.

Model 1 shows the control model. Model 2 shows the results with all controls, the independent variable, and moderating variables. In model 2, entrepreneurship

Table 2 Descriptive statistics and correlation matrix

	Mean	S.D	1	2	3	4	5	6	7	8	9
1. GVC participation	4.376	0.305	1								
2. National entrepreneurial dynamism	10.28	8.560	0.229***	1							
3. IPR protection	4.343	1.177	−0.202***	−0.521***	1						
4. R&D employment	3.124	1.877	0.0990	−0.538***	0.751***	1					
5. High-technology exports	13.62	7.656	−0.286***	−0.438***	0.683***	0.449***	1				
6. Listed domestic companies	0.888	1.317	0.208***	−0.185**	0.329***	0.338***	0.277***	1			
7. GDP	8.372	3.385	0.0360	−0.200***	0.134*	0.0750	0.208***	0.318***	1		
8. Revenue	11.57	30.69	0.384***	0.344***	−0.155**	−0.100	−0.162**	−0.0280	−0.0380	1	
9. Merchandise imports	0.322	0.481	0.0280	−0.128*	0.398***	0.271***	0.535***	0.792***	0.278***	−0.0440	1

+$p<0.1$, *$p<0.05$, **$p<0.01$, ***$p<0.001$

Table 3 Estimation results for the GVC participation

	GVC participation		
	Model 1	Model 2	Model 3
High-technology exports	−0.0002	0.00136	0.0017
	(0.0031)	(0.00302)	(0.0028)
Listed domestic companies	0.0543[+]	0.0358	0.0283
	(0.0323)	(0.0309)	(0.0281)
GDP	−0.0047*	−0.00331	−0.0029
	(0.0019)	(0.00232)	(0.0021)
Revenue	0.0028***	0.00294	0.0008
	(0.0007)	(0.00267)	(0.0025)
Merchandise imports	0.186*	0.114	0.250***
	(0.0742)	(0.0704)	(0.0701)
National entrepreneurial dynamism		0.0055**	0.0234***
		(0.0018)	(0.0067)
IPR protection		0.0568[+]	0.0926**
		(0.0309)	(0.0330)
R&D employment		0.0034	0.0433*
		(0.0208)	(0.0217)
National entrepreneurial dynamism * IPR protection			−0.0034[+]
			(0.0020)
National entrepreneurial dynamism* R&D employment			−0.0033*
			(0.0013)
Constants	4.248***	3.934***	3.652***
	(0.0659)	(0.1481)	(0.1563)
Observations	138	123	123
R-squared	0.236	0.274	0.414
Number of countries	18	17	17

[+]$p < 0.1$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, standard errors in parentheses

is positively related to GVC participation ($\beta = 0.0055$, $p < 0.01$), **supporting Hypothesis 1**. In addition, IPR protection is positively related to GVC participation ($\beta = 0.0568$, $p < 0.1$), while the positive relationship between R&D employment and GVC participation is not significant ($\beta = 0.0034$, n.s.).

Model 3 shows the full model with all controls, the independent variable, and the interaction terms of the independent variable and moderating variables. Model 3 shows the contingent role of IPR protection in the relationship between entrepreneurship and GVC participation ($\beta = -0.0034$, $p < 0.1$), **supporting Hypothesis 2**. This suggests that the positive relationship between entrepreneurship and GVC participation is stronger among countries or regions with lower levels of IPR protection. Figure 1 depicts the moderating effect of IPR protection in the aforementioned relationship.
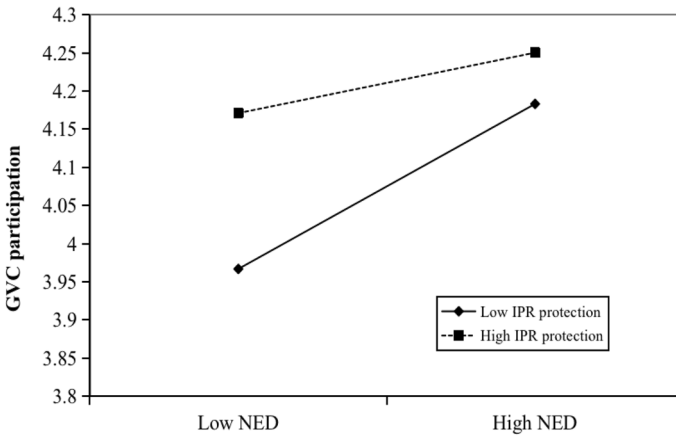
Fig. 1 The moderating effect of IPR protection. NED in Figs. 1 and 2 is the abbreviation of national entrepreneurial dynamism

Additionally, Model 3 shows the contingent role of R&D employment in the relationship between entrepreneurship and GVC participation ($\beta = -0.0033$, $p < 0.05$), **supporting Hypothesis 3**. This finding suggests that the positive relationship between entrepreneurship and GVC participation is stronger among countries or regions with a smaller amount of R&D employment. Figure 2 depicts the moderating effect of R&D employment in the aforementioned relationship.
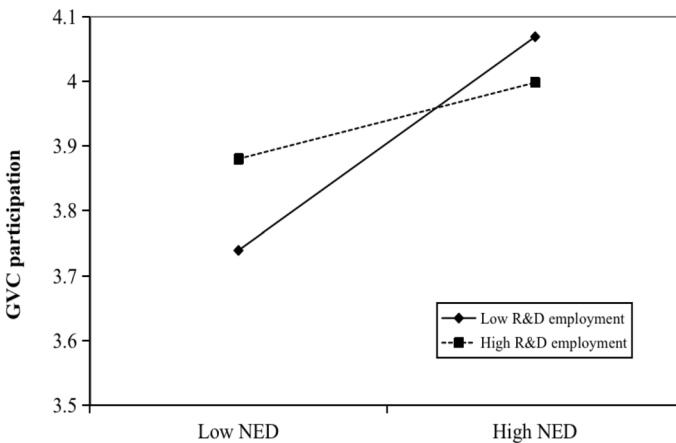

Fig. 2 The moderating effect of R&D employment

Endogeneity Tests and Robustness Test

Endogeneity Tests

GVCs potentially contribute to promoting entrepreneurial activities (Contreras et al. 2012), as they provide learning and innovation opportunities through knowledge and technology spillover (De Marchi et al. 2018; Kumar and Liu 2005). Therefore, there might be reverse causality in our study. To reduce the endogeneity problem, we adopted a one-period lag for entrepreneurship as our independent variable. Table 4 shows the results of our regression with the one-period lag for entrepreneurship. Model 2 shows that entrepreneurship is positively associated with a country's GVC participation ($\beta = 0.0067$, $p < 0.001$). IPR protection is positively related to GVC participation ($\beta = 0.0258$, $p < 0.1$), while the positive relationship between

Table 4 Estimation results of endogenous exclusion (one-period lag for entrepreneurship)

	GVC participation		
	Model 1	Model 2	Model 3
High-technology exports	− 0.0002	0.0030	0.0028
	(0.0031)	(0.0032)	(0.0029)
Listed domestic companies	0.0543[+]	0.0477	0.0306
	(0.0323)	(0.0305)	(0.0286)
GDP	− 0.0047*	− 0.0007	0.0002
	(0.0019)	(0.0021)	(0.0019)
Revenue	0.0028***	0.0028	0.0015
	(0.0007)	(0.0026)	(0.0025)
Merchandise imports	0.186*	0.105	0.238**
	(0.0742)	(0.0709)	(0.0707)
National entrepreneurial dynamism		0.0067***	0.0250***
		(0.0019)	(0.0069)
IPR protection		0.0258[+]	0.0456*
		(0.0155)	(0.0197)
R&D employment		0.0131	0.0589**
		(0.0211)	(0.0219)
National entrepreneurial dynamism * IPR protection			− 0.0036[+]
			(0.0021)
National entrepreneurial dynamism* R&D employment			− 0.0031*
			(0.0014)
Constants	4.248***	3.971***	3.750***
	(0.0659)	(0.130)	(0.133)
Observations	138	118	118
R-squared	0.236	0.258	0.407
Number of countries	18	17	17

$+ p < 0.1$, $* p < 0.05$, $** p < 0.01$, $*** p < 0.001$, standard errors in parentheses

R&D employment and GVC participation is not significant ($\beta = 0.0131$, n.s.). Model 3 shows the contingent role of IPR protection in the relationship between entrepreneurship and GVC participation ($\beta = -0.0036$, $p < 0.1$). In addition, Model 3 shows the contingent role of R&D employment in the relationship between entrepreneurship and GVC participation ($\beta = -0.0031$, $p < 0.05$). The results still support our hypotheses.

Additionally, we adopted instrumental variable (IV) estimation to address the possible endogeneity problem. A feasible IV should meet two criteria: (1) it correlates with the endogenous variable; (2) it does not correlate with the error term in the equation, reaching the condition of exclusion restriction. As national entrepreneurial dynamism is the potential endogenous variable in terms of GVC participation, we choose 'governmental support', which refers to the extent to which public policies support entrepreneurship, as the instrumental variable. Table 5 shows the results of IV estimation, including the underidentification test and IV test. Specifically, model 1 indicates that the instrumental variable can be identified and is thus effective, as the Anderson canon. corr. LM statistic is significant ($\beta = 5.0100$, $p < 0.05$). Model 2 indicates that national entrepreneurial dynamism is also positively associated with GVC participation ($\beta = 0.0217$, $p < 0.1$), although the possible endogeneity problem has been taken into consideration. Therefore, the results still support the hypothesis that national entrepreneurial dynamism is positively related to GVC participation.

Robustness test

We used one method to conduct robustness test. Specifically, we followed the studies of Aulakh et al. (2013), Ivus (2015), and Sweet and Maggio (2015) and adopted the GP (Ginartea-Park) index to measure IPR protection. This index is collected every 5 years.

Table 6 shows the results of our regression with the GP index measuring IPR protection. Model 2 shows that entrepreneurship is positively associated with a country's GVC participation ($\beta = 0.0058$, $p < 0.01$). IPR protection is positively related to GVC participation ($\beta = 0.4210$, $p < 0.05$), while the positive relationship between R&D employment and GVC participation is not significant ($\beta = 0.0048$, n.s.). Model 3 shows the contingent role of IPR protection in the relationship between entrepreneurship and GVC participation ($\beta = -0.0086$, $p < 0.05$). In addition, Model 3 shows the contingent role of R&D employment in the relationship between entrepreneurship and GVC participation ($\beta = -0.0041$, $p < 0.05$).

Conclusion and Discussion

The special issue of *The European Journal of Development Research* has concluded that there is a coevolutionary relationship between NISs and GVCs (Lema et al. 2018, 2019), making progress in shifting emphasis from the determined role of lead firms of developed countries to the NISs of developing countries in the innovation performance of developing countries. These findings reveal the importance of absorption capability supported by national institutions, policies,

Table 5 Endogeneity test

	GVC participation	
	Underidentifi-cation test	IV test
	Model 1	Model 2
National entrepreneurial dynamism	0.0217*	0.0217+
	(0.0107)	(0.0112)
IPR protection	0.0330	0.0330
	(0.0548)	(0.0575)
R&D employment	0.0020	0.0020
	(0.0326)	(0.0341)
High-technology exports	0.0070	0.0070
	(0.0055)	(0.0058)
Listed domestic companies	0.0322	0.0322
	(0.0539)	(0.0565)
GDP	0.0014	0.0014
	(0.0051)	(0.0053)
Revenue	0.0013	0.0013
	(0.0053)	(0.0055)
Merchandise imports	−0.0617	−0.0617
	(0.1490)	(0.1560)
Anderson canon. corr. LM statistic	5.010*	NA
Observations	106	106
Number of countries	17	17
R-squared	−0.343	NA
Constant	NA	3.860***
	NA	(0.226)

$^{+}p<0.1$, $^{*}p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$, standard errors in parentheses

Instrument variable: Governmental support on entrepreneurship

R-squared here less than zero is acceptable, because TSS is not equal to the sum of RSS and ESS under IV estimation

and infrastructures in impacting learning and innovation behavior in developing countries. However, the current studies are not sufficient for explaining why some countries still improve GVC participation despite their weak NISs. Acs et al. (2014) enlighten that the lack of encompassing entrepreneurship into NISs may cause the gap. In other words, similar to other national capability indicators such as IPR protection and R&D employment (Sampath and Vallejo 2018), national entrepreneurial dynamism should be treated as a critical element of NISs, as it reflects the systemic entrepreneurship phenomenon (Acs et al. 2014). Therefore, this study aims to examine whether national entrepreneurial dynamism impacts GVC participation as well as whether it is conditioned by other elements of NISs (i.e., IPR protection and R&D employment). In this study, we

Table 6 Estimation results of robustness tests for IPR protection (alternative measure)

	GVC participation		
	Model 1	Model 2	Model 3
High-technology exports	−0.0002	0.0025	0.0028
	(0.0031)	(0.0032)	(0.0031)
Listed domestic companies	0.0543[+]	0.0406	0.0354
	(0.0323)	(0.0320)	(0.0309)
GDP	−0.0047*	−0.0002	−0.0003
	(0.0019)	(0.0023)	(0.0022)
Revenue	0.0028***	0.0023	0.0019
	(0.0007)	(0.0028)	(0.0027)
Merchandise imports	0.186*	0.122	0.228**
	(0.0742)	(0.0738)	(0.0798)
National entrepreneurial dynamism		0.0058**	0.0164
		(0.0021)	(0.0154)
IPR protection		0.4210*	0.0868
		(0.195)	(0.288)
R&D employment		0.0048	0.0371
		(0.0234)	(0.0258)
National entrepreneurial dynamism * IPR protection			−0.0086*
			(0.0039)
National entrepreneurial dynamism * R&D employment			−0.0041*
			(0.0016)
Constants	4.248***	2.333**	3.667**
	(0.0659)	(0.848)	(1.231)
Observations	138	107	107
R-squared	0.236	0.310	0.375
Number of countries	18	15	15

[+]$p<0.1$, *$p<0.05$, **$p<0.01$, ***$p<0.001$, standard errors in parentheses

find that national entrepreneurial dynamism is positively related to GVC participation and that IPR protection and R&D employment are boundary conditions of the aforementioned relationship. Specifically, the focal positive relationship is stronger among countries with lower levels of IPR protection and smaller amounts of R&D employment. These findings suggest that entrepreneurship contributes to GVC participation and that the contributor effect will be stronger in countries that have weaker IPR protection and smaller R&D employment. This study contributes to the research on the NIS-GVC relationship by encompassing entrepreneurship into NISs and examining the interactive effect of different NIS elements. Therefore, it supplements NISs with individual agencies, helping answer why some countries with weak institutions still improve GVC participation.

Theoretical Contributions

The theoretical contributions of this study are threefold. First, this study adds to the NIS literature by identifying the contributor role of entrepreneurship in promoting GVC participation, supplementing NISs with an element of creative individual agency. Prior NIS literature has made progress in revealing the impact of institutional and industrial structures on learning and innovation during GVCs (Nelson 1993; Lema et al. 2018, 2019). Specifically, the NIS literature generally emphasizes the set of institutions whose interactions determine the learning and innovation opportunities in specific GVC settings (Jurowetzki et al. 2018), as institutions, policies, and infrastructures in the systems provide the foundation for knowledge transmission, diffusion, absorption and implementation (Haakonsson and Slepniov 2018). However, the prior NIS literature explores the impact on GVCs mainly from a structure perspective, namely, the structure of NISs determines the value creation of knowledge, overlooking the role of creative individual agency such as entrepreneurs in the systems (Hung and Whittington 2011). Based on the work of Acs et al. (2014), this study integrates national entrepreneurial dynamism into NISs. Our results indicate that entrepreneurship contributes to GVC participation, enhancing the predictive power of NIS theory for GVC-related activities by emphasizing the individual agency of NISs.

Second, this study contributes to the GVC literature by identifying a country's internal driving force for GVC participation, revealing that entrepreneurship promotes the DVAR of exported products by increasing their productivity, diversification, and quality of domestic intermediary products. Specifically, previous studies focus on the impact of external factors on GVC participation, indicating the role of FDI and imported materials in improving DVAR (Amendolagine et al. 2019; Kee 2015; Kee and Tang 2016). Our study provides empirical evidence for the positive impact of internal entrepreneurship on a country's GVC participation, extending the existing findings about the positive relationship between entrepreneurs/new ventures and value creation in GVCs based on case studies (Sun et al. 2010; Te Velde et al. 2006). Therefore, this study reveals a country's internal avenue for promoting GVC participation, emphasizing the essential role of entrepreneurship in helping a country achieve more DVAR from participating in globalization.

Third, this study enriches the NIS-GVC relationship literature by identifying boundary conditions under which the positive relationship between entrepreneurship and GVC participation is greater by examining the interactive effect among NIS elements. Based on previous NIS studies (Nelson 1993; Lema et al. 2018, 2019), this study integrates entrepreneurship into NISs (Acs et al. 2014; Hung and Whittington 2011; Radosevic 2007) and examines the interactive effect between entrepreneurship and other elements (i.e., IPR protection and R&D employment) of NISs (Sampath and Vallejo 2018). The results indicate that the relationship between national entrepreneurial dynamism and GVC participation is stronger in countries with lower levels of IPR protection or smaller numbers of R&D employment. Therefore, this study implies that entrepreneurship can help a country mitigate the disadvantages in its institutional and industrial structure and improve GVC participation. In other words, the creative individual agency in NISs is an efficient internal driving force for

a country to acquire more DVAR from participating globalization despite its weak institutions, policies, and infrastructures. The findings provide explanations for the GVC participation of some developing countries, such as China and India, which are economies with underdeveloped institutional settings (Peng et al. 2017a, 2017b) but a high entrepreneurship rate (GEM 2019/2020).

Practical Implications

The practical implications of this study are threefold. First, policy makers can strengthen NISs by encouraging entrepreneurial activities, thus helping their country improve GVC participation during globalization. The building and refinement of national institutions, policies, and infrastructures are progressive, as these NIS elements are affected by history, geography, and social culture. In other words, refining the existing institutional and industrial structure is a relatively time-lasting and difficult process. Therefore, a country may need to invest much time and budget to enhance its NISs so that it can acquire an improvement in DVAR. However, during the era of the internet, entrepreneurship is becoming easier, more affordable, and more feasible. The vitality of entrepreneurial activities can contribute to the improvement of NISs, subsequently promoting their capability for better learning and innovation and acquiring superior GVC participation performance.

Second, managers should pay more attention to the national internal avenue for GVC participation. During the current GVCs, many countries, especially developing countries, have a large proportion of participation in GVCs while acquiring a relatively low DVAR and having difficulty in enhancing GVC participation. Traditionally, a country's GVC participation mainly depends on external factors such as FDI and imported materials (Amendolagine et al. 2019; Kee 2015; Kee and Tang 2016), leading to this country having a passive state in globalization. In this context, a country is likely to suffer from 'GVCs low-locked' or the 'internationalization trap', which refers to a phenomenon in which a country heavily participates in GVCs but gains a very small amount of DVAR. The finding of the positive impact of national internal entrepreneurial activities on GVC participation reveals an alternative path for a country to acquire DVAR when it participates in globalization. Therefore, managers ought to focus more on their country's internal activities that can promote GVC participation.

Third, policy makers should focus on both structure and individual agency when they decide to enhance their country's NISs, which can help improve the efficiency of learning and innovation to achieve better coevolution with GVCs. An efficient system relies on the coordination and coupling of its elements to support better globalization. For NISs, the institutional and industrial structure relates to the transmission and dissemination of knowledge, and the creative individual agency also induces the series of value creation improvement activities by strengthening the effect of knowledge spillover. This study finds the substituting effect of entrepreneurship on IPR protection or R&D employment, revealing that entrepreneurs can help a country overcome its weaknesses in institutions or infrastructures. Therefore, shaping a favorable institutional and industrial structure and encouraging more

entrepreneurial activities contribute to the construction of more solid NISs that support GVC participation. In particular, developing economies can support high-quality entrepreneurship to reduce the negative impact of weak institutional settings when they intend to acquire more DVAR from globalization participation.

Limitations and Future Research Directions

There are several limitations in our study, but they offer directions for future research opportunities. First, we use data from 20 countries over a span of 9 years. After matching data from GEM and UIBE, we eventually obtained a relatively small sample size. Although the sampling distribution captures enough variance, future research can use GVC participation data from other sources that enable a relatively larger sample to be collected. Second, we explore the contingent effects of IPR protection and R&D employment in the entrepreneurship–GVC participation relationship, indicating that entrepreneurship is an alternative way to acquire GVC participation for countries or regions facing disadvantages in institutions or infrastructure. However, we lack an examination of other boundary conditions of entrepreneurship–GVC participation. Thus, future research can explore more contingent roles to enrich the findings on the NIS–GVC relationship. Third, instead of national entrepreneurial dynamism, factors such as 'the theft of technology' may also facilitate firms' participation to GVCs, which then may bias some results in the paper. Due to data limitation, this study did not control for this. Future research may include proxy variables such as 'technology lawsuits' or 'technology litigation', when available, to reduce the bias. Fourth, we examine the entirety of entrepreneurial activities of a country, lacking a deeper exploration of which specific type of entrepreneurship has mainly driven GVC participation. Future research can focus on the impact of different types of entrepreneurship on GVC participation.

References

Acs, Z.J., E. Autio, and L. Szerb. 2014. National systems of entrepreneurship: Measurement issues and policy implications. *Research Policy* 43 (3): 476–494.

Acs, Z.J., P. Braunerhjelm, D.B. Audretsch, and B. Carlsson. 2009. The knowledge spillover theory of entrepreneurship. *Small Business Economics* 32 (1): 15–30.

Ahlstrom, D., Yang, X., Wang, L., and Wu, C. 2018. A global perspective of entrepreneurship and innovation in China. *Multinational Business Review* 26 (4):302–318.

Amendolagine, V., A.F. Presbitero, R. Rabellotti, and M. Sanfilippo. 2019. Local sourcing in developing countries: The role of foreign direct investments and global value chains. *World Development* 113: 73–88.

Aulakh, P.S., M.S. Jiang, and S. Li. 2013. Licensee technological potential and exclusive rights in international licensing: A multilevel model. *Journal of International Business Studies* 44 (7): 699–718.

Becker, M.C., and T. Knudsen. 2002. Schumpeter 1911: Farsighted visions on economic development. *American Journal of Economics and Sociology* 61 (2): 387–403.

Belderbos, R., B. Leten, and S. Suzuki. 2013. How global is R&D? Firm-level determinants of home-country bias in R&D. *Journal of International Business Studies* 44 (8): 765–786.

Brancati, E., R. Brancati, and A. Maresca. 2017. Global value chains, innovation and performance: Firm-level evidence from the Great Recession. *Journal of Economic Geography* 17 (5): 1039–1073.

Braunerhjelm, P., and R. Svensson. 2010. The inventor's role: Was Schumpeter right? *Journal of Evolutionary Economics* 20 (3): 413–444.

Buckley, P.J. 2009. Internalisation thinking: From the multinational enterprise to the global factory. *International Business Review* 18 (3): 224–235.

Cohen, J., P. Cohen, S.G. West, and L.S. Aiken. 2003. *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*, 3rd ed. London: Erlbaum.

Contreras, O.F., J. Carrillo, and J. Alonso. 2012. Local entrepreneurship within global value chains: A case study in the Mexican automotive industry. *World Development* 40 (5): 1013–1023.

De Marchi, V., E. Giuliani, and R. Rabellotti. 2018. Do global value chains offer developing countries learning and innovation opportunities? *The European Journal of Development Research* 30 (3): 389–407.

Fagerberg, J., B.Å. Lundvall, and M. Srholec. 2018. Global value chains, national innovation systems and economic development. *The European Journal of Development Research* 30 (3): 533–556.

Franssen, L. 2020. Capturing value in south–south and south–north value chains: Evidence from East Africa. *The European Journal of Development Research* 32 (4): 939–975.

Global Entrepreneurship Monitor. 2019/2020. *Global Report*. London: Global Entrepreneurship Research Association.

Gereffi, G., J. Humphrey, and T. Sturgeon. 2005. The governance of global value chains. *Review of International Political Economy* 12 (1): 78–104.

Gereffi, G., and K. Fernandez-Stark. 2010. The offshore services value chain: Developing countries and the crisis. *Policy Research Working Paper* 4: 206–234.

Gereffi, G., and J. Lee. 2012. Why the world suddenly cares about global supply chains. *Journal of Supply Chain Management* 48 (3): 24–32.

Grossman, G.M., and E. Helpman. 1991. Quality ladders in the theory of growth. *The Review of Economic Studies* 58 (1): 43–61.

Haakonsson, S.J., and D. Slepniov. 2018. Technology transmission across national innovation systems: The role of Danish suppliers in upgrading the wind energy industry in China. *The European Journal of Development Research* 30 (3): 462–480.

Hagemejer, J. 2018. Trade and growth in the new member states: The role of global value chains. *Emerging Markets Finance and Trade* 54 (11): 2630–2649.

Hannan, M.T., and J. Freeman. 1977. The population ecology of organizations. *American Journal of Sociology* 82 (5): 929–964.

Humphrey, J., and H. Schmitz. 2002. How does insertion in global value chains affect upgrading in industrial clusters? *Regional Studies* 36 (9): 1017–1027.

Humphrey, J., K. Ding, M. Fujita, S. Hioki, and K. Kimura. 2018. Platforms, innovation and capability development in the Chinese domestic market. *The European Journal of Development Research* 30 (3): 408–423.

Hung, S.C., and R. Whittington. 2011. Agency in national innovation systems: Institutional entrepreneurship and the professionalization of Taiwanese IT. *Research Policy* 40: 526–538.

Ivus, O. 2015. Does stronger patent protection increase export variety? Evidence from US product-level data. *Journal of International Business Studies* 46 (6): 724–731.

Jangam, B.P., and B.N. Rath. 2020. Does global value chain participation enhance domestic value-added in exports? Evidence from emerging market economies. *International Journal of Finance & Economics* 26: 1681–16944.

Jurowetzki, R., R. Lema, and B.Å. Lundvall. 2018. Combining innovation systems and global value chains for development: Towards a research agenda. *The European Journal of Development Research* 30 (3): 364–388.

Kaiser, U., H.C. Kongsted, K. Laursen, and A.K. Ejsing. 2018. Experience matters: The role of academic scientist mobility for industrial innovation. *Strategic Management Journal* 39 (7): 1935–1958.

Kano, L. 2018. Global value chain governance: A relational perspective. *Journal of International Business Studies* 49 (6): 684–705.

Kano, L., E.W. Tsang, and H.W.C. Yeung. 2020. Global value chains: A review of the multi-disciplinary literature. *Journal of International Business Studies* 51: 577–622.

Kee, H.L. 2015. Local intermediate inputs and the shared supplier spillovers of foreign direct investment. *Journal of Development Economics* 112: 56–71.

Kee, H.L., and H. Tang. 2016. Domestic value added in exports: Theory and firm evidence from China. *American Economic Review* 106 (6): 1402–1436.

Keijser, C., and M. Iizuka. 2018. Looking beyond global value chains in capacity development: The case of the IT-enabled service (ITES) sector in South Africa. *The European Journal of Development Research* 30 (3): 442–461.

Kim, Y.K., and K. Lee. 2015. Different impacts of scientific and technological knowledge on economic growth: Contrasting science and technology policy in East Asia and Latin America. *Asian Economic Policy Review* 10 (1): 43–66.

Koopman, R., Z. Wang, and S.J. Wei. 2014. Tracing value-added and double counting in gross exports. *American Economic Review* 104 (2): 459–494.

Kumar, S., and D. Liu. 2005. Impact of globalisation on entrepreneurial enterprises in the world markets. *International Journal of Management and Enterprise Development* 2 (1): 46–64.

Laplume, A.O., B. Petersen, and J.M. Pearce. 2016. Global value chains from a 3D printing perspective. *Journal of International Business Studies* 47 (5): 595–609.

Lee, K., M. Szapiro, and Z. Mao. 2018. From global value chains (GVC) to innovation systems for local value chains and knowledge creation. *The European Journal of Development Research* 30 (3): 424–441.

Lema, R., C. Pietrobelli, and R. Rabellotti. 2019. Chapter 23: Innovation in global value chains. In *Handbook on Global Value Chains*, ed. S. Ponte, 370–384. Cheltenham: Edward Elgar Publishing.

Lema, R., R. Rabellotti, and P.G. Sampath. 2018. Innovation trajectories in developing countries: Co-evolution of Global Value Chains and innovation systems. *The European Journal of Development Research* 30 (3): 345–363.

Lundvall, B.A. 1992. *National Systems of Innovations*. London: Pinter Publishers.

Lundvall, B.A. 1999. National business systems and national systems of innovation. *International Studies of Management & Organization* 29 (2): 60–77.

Malerba, F., and M. McKelvey. 2020. Knowledge-intensive innovative entrepreneurship integrating Schumpeter, evolutionary economics, and innovation systems. *Small Business Economics* 54 (2): 503–522.

Mazzi, C.T., N. Foster-McGregor, and G.E. de Sousa Ferreira. 2021. Production fragmentation and upgrading opportunities for exporters: An empirical assessment of the case of Brazil. *World Development* 138: 105151.

Meyers, L.S., G. Gamst, and A.J. Guarino. 2016. *Applied Multivariate Research: Design and Interpretation*. Thousand Oaks: Sage.

Mitra, J. 2019. *Entrepreneurship, Innovation and Regional Development: An Introduction*. New York: Routledge.

Miller, R.E., and U. Temurshoev. 2017. Output upstreamness and input downstreamness of industries/countries in world production. *International Regional Science Review* 40 (5): 443–475.

Morrison, A., C. Pietrobelli, and R. Rabellotti. 2008. Global value chains and technological capabilities: A framework to study learning and innovation in developing countries. *Oxford Development Studies* 36 (1): 39–58.

Mudambi, R. 2008. Location, control and innovation in knowledge-intensive industries. *Journal of Economic Geography* 8 (5): 699–725.

Mueller, P. 2006. Exploring the knowledge filter: How entrepreneurship and university-industry relationships drive economic growth. *Research Policy* 35 (10): 1499–1508.

Nandkumar, A., and K. Srikanth. 2016. Right person in the right place: How the host country IPR influences the distribution of inventors in offshore R&D projects of multinational enterprises. *Strategic Management Journal* 37 (8): 1715–1733.

Nelson, R.R. 1993. *National Innovation Systems: A Comparative Analysis*. New York: Oxford University Press.

Neter, J., W. Wasserman, and M.H. Kutner. 1985. Applied linear statistical models: Regression. In *Analysis of Variance, and Experimental Designs*, 2nd ed., ed. J.D. Jobson. Homewood: Richard D.

Park, E., and M.K.E. Gachukia. 2020. The role of the local innovation system for inclusive upgrading in the global value chain: The case of KenyaGAP in the Kenyan Horticultural Sector. *The European Journal of Development Research*. https://doi.org/10.1057/s41287-020-00285-w.

Peng, M.W., D. Ahlstrom, S.M. Carraher, and W.S. Shi. 2017a. An institution-based view of global IPR history. *Journal of International Business Studies* 48 (7): 893–907.

Peng, M.W., D. Ahlstrom, S.M. Carraher, and W.S. Shi. 2017b. History and the debate over intellectual property. *Management and Organization Review* 13 (1): 15–38.

Pietrobelli, C., and R. Rabellotti. 2011. Global value chains meet innovation systems: Are there learning opportunities for developing countries? *World Development* 39 (7): 1261–1269.

Pietrobelli, C., and C. Staritz. 2018. Upgrading, interactive learning, and innovation systems in value chain interventions. *The European Journal of Development Research* 30 (3): 557–574.

Ponte, S., and T. Sturgeon. 2014. Explaining governance in global value chains: A modular theory-building effort. *Review of International Political Economy* 21 (1): 195–223.

Ponte, S., G. Gereffi, and G. Raj-Reichert. 2019. Introduction to the handbook on global value chains. In *Handbook on Global Value Chains*, ed. S. Ponte, et al., 1–27. Cheltenham: Edward Elgar Publishing.

Radosevic, S. 2007. National systems of innovation and entrepreneurship: In search of a missing link. In: Economics Working Papers. University College London, London.

Raj-Reichert, G. 2019. Chapter 22:The role of transnational first-tier suppliers in GVC governance. In *Handbook on Global Value Chains*, ed. S. Ponte, et al., 354–369. Cheltenham: Edward Elgar Publishing.

Reitzig, M., and P. Puranam. 2009. Value appropriation as an organizational capability: The case of IP protection through patents. *Strategic Management Journal* 30 (7): 765–789.

Reynolds, P., N. Bosma, E. Autio, S. Hunt, N. De Bono, I. Servais, and N. Chin. 2005. Global ***entrepreneurship monitor: Data collection design and implementation 1998–2003. *Small Business Economics* 24 (3): 205–231.

Sampath, P.G., and B. Vallejo. 2018. Trade, global value chains and upgrading: What, when and how? *The European Journal of Development Research* 30 (3): 481–504.

Shane, S., and S. Venkataraman. 2000. The promise of entrepreneurship as a field of research. *Academy of Management Review* 25 (1): 217–226.

Strange, R., and J. Humphrey. 2019. What lies between market and hierarchy? Insights from internalization theory and global value chain theory. *Journal of International Business Studies* 50 (8): 1401–1413.

Sun, S.L., H. Chen, and E.G. Pleggenkuhle-Miles. 2010. Moving upward in global value chains: The innovations of mobile phone developers in China. *Chinese Management Studies* 4 (4): 305–321.

Sweet, C.M., and D.S.E. Maggio. 2015. Do stronger intellectual property rights increase innovation? *World Development* 66: 665–677.

Tajoli, L., and G. Felice. 2018. Global value chains participation and knowledge spillovers in developed and developing countries: An empirical investigation. *The European Journal of Development Research* 30 (3): 505–532.

Tan, K.G., L.N. Trieu Duong, and H.Y. Chuah. 2019. Impact of exchange rates on ASEAN's trade in the era of global value chains: An empirical assessment. *The Journal of International Trade & Economic Development* 28 (7): 873–901.

Te Velde, D.W., J. Rushton, K. Schreckenberg, E. Marshall, F. Edouard, A. Newton, and E. Arancibia. 2006. Entrepreneurship in value chains of non-timber forest products. *Forest Policy and Economics* 8 (7): 725–741.

Turkina, E., and A. Van Assche. 2018. Global connectedness and local innovation in industrial clusters. *Journal of International Business Studies* 49 (6): 706–728.

Upward, R., Z. Wang, and J. Zheng. 2013. Weighing China's export basket: The domestic content and technology intensity of Chinese exports. *Journal of Comparative Economics* 41 (2): 527–543.

Wang, L., and Tan, J. 2018. Social structure of regional entrepreneurship: The impacts of collective action of incumbents on entrants. *Entrepreneurship Theory and Practice* 43 (5): 855–879.

Wang, J., G. Wan, and C. Wang. 2019. Participation in GVCs and CO2 emissions. *Energy Economics* 84: 104561.

Wang, Z., S.J. Wei, X. Yu, and K. Zhu. 2017. *Characterizing Global Value Chains: Production Length and Upstreamness*. Cambridge: National Bureau of Economic Research.

Young, S.L., C. Welter, and M. Conger. 2018. Stability vs. flexibility: The effect of regulatory institutions on opportunity type. *Journal of International Business Studies* 49 (4): 407–441.

Zhang, Y., and M. Gregory. 2011. Managing global network operations along the engineering value chain. *International Journal of Operations & Production Management* 31 (7): 736–764.