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RESEARCH ARTICLE

Global value chains from an evolutionary economic geography perspective: a research agenda

Ron Boschma [a,b]

ABSTRACT

The research agendas of evolutionary economic geography (EEG) and global value chains (GVCs) have developed more or less independently from each other, with little interaction so far. This is unfortunate because both streams of literature have a lot to offer each other. This paper explores how, looking at four strands in the GVC literature. Promising crossovers between EEG and the GVC literature are identified, but also some missing links that need to be taken up in future research. These new research avenues, promoting the adoption of an evolutionary perspective on GVCs, are expected to enrich both literatures in mutual ways.

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摘要

演化经济地理学视角下的全球价值链:研究议程. *Area Development and Policy*. 演化经济地理学(EEG)和全球价值链(GVC)的研究议程基本上是相互独立的,迄今为止两者之间几乎没有互动。这是不幸的,因为这两种文学流派都有很多可以相互借鉴的东西。本文从全球价值链文献的四个方面探讨了如何实现这一目标,确定EEG 和 GVC 文献之间有希望的交叉点,但也有一些缺失的环节需要在未来的研究中加以补充。这些新的研究途径促进对全球价值链的进化观点的采用,有望以共同的方式丰富这两种文献。

关键词

演化经济地理学, 全球价值链, 全球生产网络, 全球创新系统, 区域多样化, 关联性

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RESUMEN

Cadenas globales de valores desde la perspectiva de la geografía económica evolutiva: un programa de investigación. *Area Development and Policy*. Hasta ahora se han desarrollado programas de investigación sobre la geografía económica evolutiva (GEE) y las cadenas globales de valores (CGV) más o menos de forma independiente y con poca interacción entre ellas. Es una lástima porque ambas corrientes de publicaciones podrían beneficiarse mutuamente. En este artículo se analiza cómo podría ocurrir esto a partir de cuatro ámbitos en las publicaciones sobre CGV. Se identifican vínculos prometedores entre la bibliografía sobre la GEE y las CGV, pero también eslabones ausentes que deberían tenerse en cuenta en futuras investigaciones. Estas nuevas vías de investigación, que fomentan la adopción de una perspectiva evolutiva sobre las CGV, podrían servir para enriquecer mutuamente ambas publicaciones.

PALABRAS CLAVE

geografía económica evolutiva, cadenas globales de valores, redes de producción global, sistemas de innovación globales, diversificación regional, vínculos

АННОТАЦИЯ

Глобальные цепочки создания стоимости с точки зрения эволюционной экономической географии: программа исследований. *Area Development and Policy*. Исследовательская программа Эволюционной экономической географии (EEG) и Глобальных цепочек создания стоимости (GVC) развивались более или менее независимо друг от друга, до сих пор практически не взаимодействуя. Это прискорбно, потому что оба потока литературы могут многое предложить друг другу. В этой статье исследуется возможное взаимодействие с учетом четырех направлений в литературе по GVC. Выявлены многообещающие пересечения между EEG и литературой по GVC, а также некоторые недостающие звенья, которые необходимо учитывать в будущих исследованиях. Ожидается, что эти новые направления исследований, способствующие принятию эволюционного подхода к GVC, взаимно обогатят обе литературы.

КЛЮЧЕВЫЕ СЛОВА

Эволюционная Экономическая География, Глобальные Цепочки Создания Стоимости, Глобальные Производственные Сети, Глобальные Инновационные Системы, Региональная Диверсификация, Взаимосвязанность

INTRODUCTION

In a recent paper, Yeung (2021a) observed that two influential literatures in the field of economic geography, namely evolutionary economic geography (EEG) and global production networks (GPNs), had been developing more or less in isolation from each other. Yeung argued that this is regrettable because both can offer a lot to each other. He explored how the GPN literature could contribute to EEG so as to tackle a few limitations in the EEG literature. What Yeung did not discuss is what EEG could mean to the GPN literature.

This paper takes up this challenge, but also goes beyond that. It discusses four strands in economic geography that developed in the last two decades and which all share a common research interest in global value chains (GVCs): the GPN literature (Coe et al., 2008, 2004; Ernst & Kim, 2002; Henderson et al., 2002); the literature focusing on the relationship between clusters and GVCs (Giuliani et al., 2005; Humphrey & Schmitz, 2002; Morrison et al., 2008; Pietrobelli & Rabellotti, 2011); the global innovation systems/networks (GIS/

GIN) literature (Binz et al., 2016; Chaminade et al., 2016; Cooke, 2013; Ernst, 2009); and the literature that shall be referred to here as the 'geography of functions' (Los et al., 2017; Timmer et al., 2019).

The objective of the paper is twofold. First, it aims to identify existing links between EEG and this broad GVC literature. It argues there is already some interaction, but this has remained rather implicit and underdeveloped. Second, it identifies gaps and explores new promising research links between the two streams. In doing so, the paper outlines a few promising research avenues and challenges when adopting an EEG perspective on GVCs.

The remainder of the paper is structured as follows. The next section gives a very short introduction to EEG. The third to sixth sections introduce each of the four strands – respectively, GPN, clusters and GVC, GIS/GIN, and functions – identify existing and missing links with EEG, and provide some suggestions for future research. The seventh section concludes.

EVOLUTIONARY ECONOMIC GEOGRAPHY (EEG)

The main source of inspiration of EEG has been evolutionary economics (Dosi et al., 1988; Nelson & Winter, 1982), which proposed in the 1980s an alternative to mainstream neoclassical economics, rejecting the representative agent, rational decision-making and equilibrium analyses. In the 1990s, economic geographers began to explore how evolutionary principles, such as bounded rationality, variety, localized learning, path dependence and disequilibrium, could be applied and integrated in research in economic geography.

The theoretical foundations of EEG have been laid down in a number of publications in the first decade of the 21st century (e.g., Boschma & Frenken, 2006; Boschma & Lambooy, 1999; Martin & Sunley, 2006). Due to a lack of space, the main principles and concepts of EEG will not be explained in full here. In essence, evolutionary approaches to economic geography tend to share a focus on historical processes to explain uneven spatial development and transformations of the economic landscape. Uneven development and regional dynamics are perceived as the outcome of contingent historical processes that are often path dependent as well as place dependent (Boschma & Frenken, 2018).

So far, four theoretical strands of the literature have associated themselves with an evolutionary approach in economic geography, each having a particular focus, while sharing common evolutionary principles:

- Generalized Darwinism, which focuses on population dynamics of heterogenous agents at the micro-scale and how processes of mutation, selection and retention impact the evolution of the economic landscape (Klepper, 2007; Rigby & Essletzbichler, 1997).
- Path dependency, with a focus on how history matters in places, and how cities and regions follow specific trajectories and develop new growth paths (Boschma, 2004; Boschma & Lambooy, 1999; Martin, 2010; Storper, 1997).
- Complexity science, with its main focus on the evolution and adaptation of systems and networks (Hidalgo, 2021; Martin & Sunley, 2007).
- Geographical political economy (MacKinnon et al., 2009), with a focus on how politics and institutions affect the evolution of cities and regions.

Apart from these four strands, it is important to note that theoretical and conceptual debates in EEG are ongoing (e.g., Henning, 2019; Kogler, 2015; Martin & Sunley, 2015).

THE GPN–EEG NEXUS

To start exploring potential cross-fertilizations between GVC and EEG, we first discuss the GPN literature, which has been among the most successful literatures in economic geography during the last decades (Coe et al., 2008, 2004; Ernst & Kim, 2002; Henderson et al., 2002; Hess & Yeung, 2006; Yeung, 2009, 2015; Coe & Yeung, 2019). In short, it focuses on the globalization of regional development (Dicken et al., 2001), leaving behind the value chain (VC) framework of linear, vertical supply chain linkages. Instead, the GPN literature proposed a broader concept of networks (encompassing both firms and non-firm actors) around lead firms (often multinational enterprises – MNEs), focusing primarily on the process of strategic coupling of local actors and regional assets.

The GPN literature evolved rather independently from EEG, but there have been at least two serious attempts to link the two literatures.

MacKinnon (2012) was the first to make an explicit link between the EEG and GPN literatures. He provided a critical appraisal of the GPN literature, accusing the GPN approach of being too static (Fuller & Phelps, 2018). Instead, he proposed to relate the concept of strategic coupling to broader evolutionary thinking and the notion of institutional change. Building on geographical political economy, MacKinnon (2012) referred to evolutionary notions such as path dependency, lock-in and path development. Taking such a dynamic perspective, MacKinnon focused on the dynamic interplay between strategic needs of lead firms in GPNs, on the one hand, and regional assets, with regional institutions as key players, on the other. MacKinnon described those dynamics in terms of coupling, decoupling and recoupling between GPNs and regions (see also Yang, 2013). While strategic coupling in GPNs may lead to external path dependency and regional lock-in (Yeung, 2015), a key question is whether or not local capabilities, resulting from previous rounds of investments, enable a process of decoupling and recoupling. Yeung and Coe (2015) and Coe and Yeung (2015) further explored this dynamic perspective on GPNs that consist of lead firms, subsidiaries, suppliers, customers and markets. Regional institutions such as state agents, labour unions and business associations are considered critical because they enable strategic coupling by shaping and transforming regional assets (such as local know-how, politics and social relations) to match the requirements of the lead firms in GPNs. This will generate a certain type of regional development, possibly resulting in value capture, and industrial and social upgrading.

Yeung (2021a) gave a second boost to the linking of GPN with EEG. Yeung argued that EEG puts the main emphasis on the role of intra-regional capabilities rather than interregional linkages, in particular that part of EEG that focuses empirically on (related and unrelated) regional diversification.[1] This is a point well taken where it concerns the empirical literature on regional diversification,[2] although recent papers on regional diversification in EEG have started to address empirically the role of non-local linkages (e.g., Balland & Boschma, 2021; Miguelez & Moreno, 2018),[3] how relatedness might enhance regional spillovers from MNEs (e.g., Ascani & Gagliardi, 2020; Cortinovis et al., 2020), and whether related or unrelated diversification is promoted by MNEs in particular (Elekes et al., 2019; Neffke et al., 2018). Yeung (2021a) argued in favour of a 'trans-local network conception of regions' to understand processes of regional diversification. He connected the GPN concept of strategic coupling to the EEG concept of related and unrelated diversification proposed by Boschma et al. (2017). Yeung (2021a) stated that different types of strategic coupling dynamics can have an impact on the capacity of a region to diversify and make regions follow different development trajectories. A region can, for instance, decouple from low-value activities by means of unrelated

diversification through transplantation and recouple with more value-capturing activities as a result of related diversification by means of replication and exaptation.

Despite these promising developments linking more tightly the two literatures, there remain a few issues in the GPN literature that warrant further attention. It is explained below how EEG can be helpful in addressing some weaknesses or blind spots in the current GPN literature.

First, there is very little understanding of how GPNs actually emerge, and how previous rounds of investments in places provide opportunities but also set limits to new GPN formations. This is exactly where EEG can step in and open this black box in the GPN literature (Barratt & Ellem, 2019; Blažek, 2016; Dawley et al., 2019; Henry et al. 2021; MacKinnon, 2012; MacKinnon et al., 2019; Van Grunsven & Hutchinson, 2016), as Yeung (2018) admitted himself:

> ... many empirical studies … have taken for granted the initial origin and formation of GPNs, preferring to investigate their internal dynamics only in the past-establishment stage. There is a significant analytical merit in developing a truly evolutionary approach to GPNs that foregrounds the factors underpinning their initial formation and their subsequent reconfigurations.(p. 397)

Second, the GPN literature advocates a meso-level approach on networks (Yeung, 2021a), but makes limited use of network theory and network tools. As such, it does not yet exploit its full potential. EEG has been more keen on examining network configurations and how they evolve over time, employing social network methods (Boschma & Frenken, 2010; Giuliani, 2007; Ter Wal & Boschma, 2009). GPN scholars could follow in their footsteps, which would allow them to address relatively unexplored research questions such as:

- How do different network configurations of GPNs (in terms of centrality, bridging, proximities, etc.) affect regional development (Crespo et al., 2014)?
- What types of network linkages (in terms of proximities) are needed to overcome regional lock-in (Rodríguez-Pose, 2021)?
- How do these evolve over time and why (Yeung, 2021b)?
- Which complementarities in interregional networks can be identified?
- What part is played by interregional linkages that give regions access to new capabilities that are complementary to their own capabilities.
- How do they affect coupling dynamics and diversification processes in places?

Balland and Boschma (2021) have shown how crucial these can be for the development of new growth paths, especially in peripheral regions. Moreover, the GPN literature has an almost exclusive focus on networks around and driven by global lead firms (Parrilli et al., 2013):

- But what is the role of other networks that might affect regional development?
- Do other types of networks than GPNs such as migration, knowledge, financial and political networks matter for regional transformations?
- What is the importance of GPNs relative to these networks?
- To what extent is there overlap and interaction between them?[4]

Third, GPN focuses almost entirely on single GPNs, and less on the relationships with other GPNs. There is little attention for possible interactions with other GPNs, and what GPNs can mean to each other in terms of (positive and negative) externalities and spillovers. The EEG approach has a lot to offer here because one of its core competences is to identify proximities and complementarities across activities in regions both within and between GPNs,

and how they affect regional development and innovation. The theoretical and methodological toolbox of EEG could be useful in analysing GPNs not in isolation, but in relation to each other.

Fourth, there is a need to explore more explicitly the role of regional institutions and institutional change in GPNs (Rodríguez-Pose, 2021). What kinds of institutions matter for GPNs? As Rodríguez-Pose (2021) mentioned, local benefits of participation in global networks are expected to be low in weak or unfavourable institutional settings. In a way, this same critique of GPN holds for work in EEG that studied diversification in the Global South from a relatedness framework,[5] with little attention to the type of institutions in which the diversification process is embedded (Alonso & Martín, 2019; Françoso et al., 2022; Hassink, 2017; He et al., 2018; Petralia et al., 2017). Indeed, the relatedness framework is often applied as a general principle (Hidalgo et al., 2018), without considering too much the specific social, political and institutional context in which processes of regional diversification take place (He et al., 2017; MacKinnon et al., 2019). Boschma (2017) has referred to that as a 'lack of geographical wisdom'. Diversification in China is likely to be very different from diversification in Latin America because of prevailing policies and institutions, but there is still little understanding of how it differs. Studies in EEG have started to explore how national and regional institutions enable or impede diversification in certain places, and how varieties of capitalism and institutions affect the type of diversification in regions (Boschma & Capone, 2015; Cortinovis et al., 2017), but more needs to be done, especially in the Global South (Pike, 2022).

Therefore, in short, there are many potential research links between GPN and EEG that could enrich both fields of research, but which are still in need of further exploration.

CLUSTERS, GVC AND EEG

Since the 1980s, studies have documented the importance of clusters and industrial districts for regional development in the Global North (Becattini, 1979; Porter, 1998) as well in the Global South (Schmitz, 2000; Schmitz & Nadvi, 1999). Clusters were perceived to overcome liabilities of small firms in particular, such as a lack of technological expertise and poor access to international markets and finance. Clusters would reduce transaction costs, enable collective action, enhance local networking and induce local knowledge spillovers. Insights from evolutionary economics were adopted to stress the importance of cumulative, collective and localized learning in clusters (Maskell & Malmberg, 1999), as embodied in concepts such as innovative milieux (Camagni, 1991), regional innovation systems (Cooke, 1992), technology districts (Antonelli, 1994; Storper, 1992) and learning regions (Asheim, 1996; Morgan, 1997). The main focus was on local assets and localized learning that clusters provide to firms. However, less attention was paid to external linkages, although cluster firms were often active in VCs, and both clusters and VCs provide opportunities for learning and innovation (Giuliani et al., 2005).

In the early 2000s, an extensive literature on GVCs took up this topic and focused on the role of global linkages to foster upgrading in clusters (Guerrieri et al., 2001; De Marchi et al., 2018a, 2018b; Pietrobelli & Rabellotti, 2007; Turkina & Van Assche, 2018). In many of these studies, attention focused on identifying opportunities for local producers to learn from global leaders in a VC (Gereffi, 1999). Humphrey and Schmitz (2002) were the first to recognize the importance of linking clusters (with a focus on local intra-cluster linkages) to GVCs (with a focus on cross-border linkages). They set out a research programme that linked opportunities of clusters to upgrade to different types of VC governance structure (Gereffi et al., 2005).

Giuliani et al. (2005) and Pietrobelli and Rabellotti (2011) made seminal contributions in linking clusters and GVCs by drawing on evolutionary economics and bringing in

a perspective on learning and innovation. They argued that GVCs could provide learning opportunities for firms in the Global South: GVCs gave cluster firms access to not only new markets but also new knowledge, inducing learning and innovation. Pietrobelli and Rabellotti (2011) made use of the evolutionary concept of innovation systems (Lundvall, 1992; Nelson, 1993), but also criticized this literature for playing down the effect of international linkages on knowledge creation and innovation, and for giving little attention to the role of GVCs (Lema et al., 2018). They outlined how innovation systems interact with GVCs, and vice versa, in clusters in the Global South (see also Lundvall et al., 2009). GVCs were perceived to contribute to local innovation systems which in turn affect the way cluster firms participate in GVCs.

Evolutionary scholars also explored the impact of the structure of knowledge networks in clusters on the innovative performance of firms (Broekel & Boschma, 2012; Cantner & Graf, 2006; Giuliani, 2007; Giuliani & Bell, 2005; Hervas-Oliver et al., 2008; Menzel & Fornahl, 2010; Morrison, 2008; Boschma & ter Wal, 2007). They used evolutionary concepts such as the absorptive capacity of firms and proximities across firms to show that Marshall's claim that 'knowledge is in the air' in clusters does not hold (Boschma & Martin, 2010). Because cluster firms have different levels of absorptive capacity and proximities (e.g., cognitive, social, institutional) with respect to other agents (Boschma, 2005), some cluster firms are more connected and have better access to knowledge. So, not all firms benefit equally from intra-cluster knowledge (Giuliani, 2007). Crucially, this also applies to the capacity of firms to acquire and absorb non-local knowledge, and how widely non-local knowledge diffuses into the cluster (Giuliani & Bell, 2005). Studies considered interregional linkages crucial (Bathelt et al., 2004; Hervas-Oliver & Albors-Garrigos, 2008; Lorenzen & Mudambi, 2013) for improving the performance of cluster firms, but also for preventing cluster lock-in (Boschma & ter Wal, 2007; Menzel & Fornahl, 2010; De Marchi et al., 2018a). Gatekeepers were considered especially important in linking clusters to the global economy (Graf, 2011; Morrison, 2008; Morrison et al., 2013). However, not all cluster firms are able to absorb and exploit knowledge that flows into clusters through international linkages and GVCs.

In sum, in the last two decades, a rich literature has explored the nexus connecting clusters and GVCs. Evolutionary thinking has been quite influential, by developing an evolutionary take on clusters with heterogenous agents that do or do not connect in knowledge networks (Giuliani & Bell, 2005), by bringing in learning and innovation processes into the GVC literature (Giuliani et al., 2005; Pietrobelli & Rabellotti, 2007), and by stressing the importance of non-local linkages such as GVCs for cluster and regional development (Morrison et al., 2008, 2013). What still needs to be explored further is the interplay between local capabilities and GVCs (Kano et al., 2020), the extent to which GVCs contribute to new path development in clusters, and how this depends on complementarities between local and non-local capabilities (Balland & Boschma, 2021).

THE NEXUS CONNECTING GIS/GIN AND EEG

Partly related to the previous literature (but not focusing on clusters in particular) is the literature on GINs (Chaminade et al., 2016; Cooke, 2013; Ernst, 2009; Wagner & Leydesdorff, 2005), with a similar focus on learning and innovation in global networks. There is an explicit focus on actors (firms and non-firms) organized in networks that are collectively engaged in knowledge production and that connect geographically dispersed knowledge hubs. What they share is a common critique on both the GPN and GVC literature (Ambos et al., 2021; Parrilli et al., 2013).[6] First, the emphasis shifted to the globalization of knowledge exchange and innovation, rather than production. They argue that firms do not only produce or sell globally, but they also participate in knowledge creation and innovation on

a global scale. Second, they acknowledge that actors from the Global South are participating in innovation processes to an increasing extent (Horner & Nadvi, 2018; Plechero & Chaminade, 2016). That is, globalization of knowledge production and innovation is driven by MNEs in the Global North as well as in the Global South (Aoyama, 2016; Horner & Murphy, 2018).

Interestingly, these scholars have been very active in applying evolutionary concepts when studying GIS/GIN, such as capabilities and learning, network proximities, innovation systems, and complex systems. This is especially true in two research literatures, apart from relevant work in the international business literature (Cantwell et al., 2010; Cano-Kollmann et al., 2016; Buckley et al., 2017; De Marchi et al., 2020).[7]

The first literature looks at the configurations and dynamics of global knowledge networks (Wagner & Leydesdorff, 2005). It applies quantitative (network) approaches using global data sets to study dynamics in global networks of trade linkages (Organisation for Economic Co-operation and Development (OECD), 2017), research collaborations (De Rassenfosse & Seliger, 2020), co-publications (Fitzgerald et al., 2021), co-inventorships and patent citations (Montobbio & Sterzi, 2011). A key question concerns the extent to which research and development (R&D) activities are increasingly offshored (OECD, 2017). However, there is still little understanding of the effect of global knowledge networks on regional development (Parrilli et al., 2013) and the ability of regions to diversify and upgrade their VCs. Examining these relationships would connect this literature more tightly to the regional diversification literature in EEG that has expanded in the last decade (Balland & Boschma, 2021; Whittle et al., 2020).

The second concerns the emerging literature on multi-scalar networks in GIS that employs descriptive case study approaches. The focus of this research is on new path creation and system-building that goes beyond a territorial (national, regional) system perspective (Binz & Truffer, 2017; Binz et al., 2014),[8] investigating how firms and other actors mobilize and anchor resources for new industry formation in regions globally (Binz et al., 2016). The existing literature is criticized in a number of ways. First, they formulated a critique of conventional GPN/GVC literature that countries in the Global South can only climb the GVC ladder by moving into an existing GVC controlled by a lead firm from the Global North. Instead, they argued that latecomers can construct new GVCs by building local capabilities while mobilizing resources globally. Second, they leave behind a rigid conceptualization of space in terms of predefined territorial boundaries, and propose a multi-scalar perspective instead. And third, they take a broader view on new path creation by focusing not only on knowledge production/acquisition but also on building, for example, legitimacy and institutions. In that sense, they complement the EEG literature on regional diversification by unpacking the broad notion of regional capabilities while adding an explicit focus on global linkages.

GVCS, GEOGRAPHY OF FUNCTIONS AND EEG

A key question in the GVC literature is which countries/regions are capable of developing or participating in new VCs, or upgrading existing VCs. Despite some previously mentioned examples in the cluster–GVC nexus, it is fair to say that GVCs have not been a key unit of analysis in EEG research so far. While EEG has generated new insights into related diversification in regions (Hidalgo et al., 2007, 2018; Neffke et al., 2011), little knowledge yet exists of how GVCs contribute to regional diversification, and how GVCs evolve through (related) diversification in terms of upgrading and downgrading. We explore how that might be done, building on recent literature that is referred to here as the 'geography of functions',

pioneered by scholars from Groningen University using new World Input–Output data (Los et al, 2015; Timmer et al., 2015).

This emerging literature argues that countries and regions are specialized in particular tasks or functions in GVCs rather than particular products or industries, resulting in a fragmented structure of activities across space (Timmer et al., 2019). Functions not only differ in terms of their dependence on specific factor inputs but also in their propensity to be spatially sticky (Timmer & Pahl, 2021). R&D activities, for instance, show higher spatial inertia than assembly activities, with major consequences for uneven spatial development. It is important to note that this kind of thinking in terms of geographies of functions is not new at all. In fact, it has a long history in economic geography that has investigated the spatial division of labour (Dunford, 1979; Hymer, 1972; Massey, 1984) due to locational strategies of multinationals breaking down the VC into a range of discrete functions such as headquarters, R&D, design and production (Iammarino & McCann, 2010, 2013), on the one hand, and in literature that has focused on the geography of occupations (and what people actually do in terms of tasks) rather than industries (Feser, 2003; Florida, 2004; Markusen, 2004; Markusen et al., 2008; Thompson & Thompson, 1985), on the other. In international economics there is also a vast literature that has studied GVCs, trading in tasks/functions and global outsourcing (Baldwin & Robert-Nicoud, 2014; Baldwin & Venables, 2013; Grossman & Rossi-Hansberg, 2008; Venables, 1999). Also EEG has made contributions here, analysing the dynamics of occupational structures in regions in a relatedness framework (Farinha et al., 2019; Hane-Weijman et al., 2021; Muneepeerakul et al., 2013), but EEG has made little progress in incorporating such an occupation-oriented approach from a GVC perspective. A crucial question, for instance, is the extent to which regions are able to capture value in GVCs that become fragmented to an increasing extent. Following such an approach, EEG would respond to critique that it hardly accounts for questions such as who captures value from regional diversification and why diversification might be good or bad (Yeung 2021a).

So far, the regional diversification literature in EEG has focused on new activities (industries, products, technologies, occupations, scientific fields) rather than new tasks/functions within GVCs (Boschma, 2017). Here, we argue EEG should do both, though there are still a few challenges that need to be tackled. One key challenge is data availability. Although the World Input–Output data are increasingly regionalized, providing information on value capture of regions in GVCs, data restrictions are still huge, with few details in industrial and regional categories so far (Los et al., 2017; Timmer et al., 2019). Another key challenge is conceptual. There is a need to develop an EEG framework to explain the ability of a region to develop/participate in a new GVC or upgrade an existing GVC as a result of relatedness with existing GVCs in the region. This requires an assessment of possible externalities across different functions through the development of a new relatedness measure between functions that can be used as an input for the ability of regions to diversify in new functions. This would bring novel insights to the GVC literature and would also respond to the critique that the GVC literature has remained primarily qualitative (Ambos et al., 2021).

To explain GVC dynamics in regions from a relatedness framework, a new unit of analysis is needed, that is, region–industry function, that accounts for potential combinations of horizontal and vertical upgrading (Ye, 2021). Horizontal upgrading stands for the development of a new GVC (a new product or industry) in a region that is related to another GVC (a related product or industry) already present in the region, such as going from mobile phones to laptops. This so-called inter-sectoral upgrading has been a key topic of the EEG literature on regional diversification so far. Vertical upgrading has attracted little to no attention in the EEG literature. Vertical upgrading means the development of a new function (e.g., R&D, management, marketing, logistics, production) in an existing GVC, such as moving from production to R&D in laptops. This has been the key topic in the GVC literature, while this

literature has focused less attention on horizontal upgrading. A logical next step is to combine horizontal and vertical upgrading by focusing on new industry functions, and to assess whether these depend on related industry functions, such as shifting from production in laptops to R&D in mobile phones.

Doing so, we have to think carefully what we mean by upgrading (Giuliani et al., 2005).[9] In the GVC literature, the meaning of upgrading is more clear along the vertical dimension when shifting from low to high value-added functions, but it is less straightforward along the horizonal dimension. That is, moving from one industry to another is not necessarily accompanied by moving up the economic or technological ladder. One way of dealing with this is to differentiate between products or industries in terms of their complexity (Hidalgo & Hausmann, 2009). Complexity captures the difficulty of mastering capabilities that are required to excel in a product or industry which is reflected by its non-ubiquity, on the one hand, and the diversity of capabilities that need to be coordinated and combined, on the other. In this context, horizontal upgrading would happen when the new product or industry is more complex than the average complexity of all products or industries in a region.[10] Alternatively, one could construct a new complexity measure for all industry functions. Such measure would assess whether, for instance, R&D in laptops is more complex that management in mobile phones.

However, GVCs can also be investigated as input to develop a new relatedness measure. Ye (2021) developed a relatedness measure between industry functions, based on geographical co-occurrence analysis. In this way, a network of industry functions or industry-function space could be constructed, similar to the product space of Hidalgo et al. (2007). This measures the extent to which different industry functions (such as R&D in automobiles, management in textiles, production in computers) rely on similar capabilities. Ye (2021) suggests that low-skilled functions are closely related across many industries, implying the relative easiness of reallocating low-skilled workers across industries. Ye also suggests a low degree of relatedness between low- and high-skilled functions, especially in complex industries. Using this network, one can position regions in this industry-function space (including information on the complexity of all industry functions), and identify how many and what kind of diversification opportunities regions have in terms of upgrading. If a region is specialized in many industry functions in the core of this network, it would imply it has many options to diversify into new industry functions related to existing industry functions in the region. This would be in contrast to a region that is specialized in only a few industry functions positioned on the periphery of the network, with little diversification opportunities for the region as a consequence.

Introducing such an evolutionary approach in GVC research would have the potential to shed new light on regional diversification and uneven spatial development in an EEG framework. First, it could assess the ability of regions to develop a new industry function, depending on the degree of relatedness with existing industry functions in a region. Doing so, it would take up a type of regional capabilities that is different but complementary to the capabilities that have been identified by patent, industrial or occupational data.[11] Ye (2021) carried out this type of research at the national scale, suggesting that, broadly speaking, horizontal upgrading is less difficult than vertical upgrading. Such analyses at the regional scale are still missing. Second, it could provide new insights into regional lock-ins (Grabher, 1993) and development traps (Iammarino et al., 2020) into which countries and regions might get caught, such as the middle-income trap (Bresser-Pereira et al., 2020; Kharas & Kohli, 2011), the low value-added trap (Phelps et al., 2003; MacKinnon, 2012) and the low complexity trap (Pinheiro et al., 2021b). An evolutionary perspective on development traps would emphasize that path dependence in regional development might become an obstacle rather than an opportunity for innovation in regions (Arthur, 1994). These self-reinforcing

dynamics would limit the capacity of regions to move forward and diversify into new and complex activities (lock-in). Only in very recent papers has this topic started to be taken up. Pinheiro et al. (2021a, 2021b) demonstrated that lagging countries and regions might become trapped in low-complexity products because their diversification opportunities in high-complex products are very limited due to a low degree of relatedness with more complex products. Ye (2021) suggested that a country may get stuck in low-skilled tasks due to low relatedness with more high-skilled tasks in GVCs. And third, it would permit an assessment of entry and exit of industry functions in terms of economic effects on regions, and how these could affect income inequalities in and between regions. This would be in line with recent studies in EEG (Pinheiro et al., 2021b), showing that potentials to diversify in more complex technologies or industries are not evenly distributed across regions. Indeed, there is a tendency in high-complex, high-income regions to diversify in more complex activities because these are related to existing high-complex activities in the region. By contrast, low-complex, low-income regions rely more on related activities of low complexity when diversifying (Pinheiro et al., 2021b). Given the higher economic potential of complex activities (Pintar & Scherngell, 2020), this implies income disparities across regions are more likely to be reinforced as a result of diversification processes (Pinheiro et al., 2021a, 2021b).

This recent work also shows that EEG is starting to address topics of uneven regional development and to respond to the criticism that there is a tendency in EEG to focus primarily on the bright sides of regional economic evolution (such as entrepreneurship, knowledge production and diffusion, new entry and innovation), and less on its dark sides, such as inequalities, development traps, underdevelopment, and economic and intellectual monopoly power (Feldman et al., 2021; Rikap, 2021; Rikap & Flacher, 2020).

Finally, GVCs can also be treated as an independent variable to explain economic upgrading (Pahl & Timmer, 2020). Papers have looked at which regions benefitted from GVC participation. A case in point is Colozza et al. (2021) who found that more complex regions, rather than low-complex regions, tend to benefit from GVC participation. But there is still a need to assess systematically the effect of GVC participation (including changes in GVCs due to digitalization, Covid-19 or trade wars) on regional diversification (Colozza & Pietrobelli, 2021; Tajoli & Felice, 2018), let alone its relative importance alongside other mechanisms such as migration (Diodato et al., 2021; Miguelez & Morrison, 2021), research collaboration (Balland & Boschma, 2021; Giuliani et al., 2016) and labour mobility (Neffke et al., 2017). To date little work has also examined the channels through which knowledge flows within VCs and how these impact regional diversification (Bahar et al., 2019). In a comprehensive review of the GVC literature, Kano et al. (2020) argued that this topic is still a black box in research on VCs. Such a research agenda would open numerous possibilities, including an assessment of the effect of relatedness between knowledge flowing into a region through these various channels and alternately the existing knowledge base in the region.

CONCLUSIONS

The aim of the paper was to identify existing crossovers between the EEG and GVC literatures, and to explore promising new research links between them. For that purpose, four strands of research in GVCs were identified: the GPN literature; the literature focusing on the cluster–GVC nexus; the literature on GIS/GIN; and the literature linking GVCs to the geography of functions.

The paper identified some promising connections that have already been made between the EEG and GVC literatures, despite recurrent claims there has been little interaction so far. In the last decade, a few initiatives in the GPN literature embraced an EEG perspective,

linking the evolution of GPNs to the development of new growth paths (MacKinnon, 2012) and regional diversification processes (Yeung, 2021a). Parts of the research on the cluster–GVC nexus have been firmly anchored in evolutionary concepts since the 2000s, bringing insights from Schumpeterian innovation studies into the GVC literature, such as absorptive capacity (Giuliani & Bell, 2005), innovation systems (Pietrobelli & Rabellotti, 2011) and the role of knowledge networks (Giuliani, 2007), and network brokers in particular (Morrison, 2008). At the same time, this body of literature on clusters and GVC boosted the development of EEG itself by connecting knowledge networks to cluster evolution (Boschma & Frenken, 2010). Part of the expanding literature on GIS/GIN was also found to be embedded in evolutionary thinking, focusing on learning and innovation, as in the cluster–GVC literature.

However, it was also shown that EEG has remained relatively unexplored in the GVC literature. First, this applies to a dynamic perspective on GPNs and GVCs in which the origin and formation of new GPNs and GVCs still needs to be studied. The GPN literature has also shown some reluctance to make full use of network theory and network tools, which would allow it to gain more understanding of the dynamics of GPNs, to identify complementarities in global networks, and to assess their effects on coupling dynamics and diversification processes in specific territories. Second, the GVC literature has made connections with the cluster literature, but there is still room to assess how GVCs contribute to new path development in clusters, and how this depends on complementarities with local capabilities. Third, interesting ongoing research on the configurations and the dynamics of GINs was identified, but this research area still needs to become more tightly coupled with the EEG literature to shed light on their relative importance for regional diversification and uneven spatial development. Finally, a new research agenda was identified taking up GVCs as a new unit of analysis in EEG (i.e., region–industry function), and embedding it in the EEG framework of relatedness. This agenda has the potential to shed new light in the GVC literature on the process of regional upgrading and diversification, to identify the diversification opportunities of each region in terms of their potential to develop new industry functions, to provide new insights into how lock-ins and development traps in regions can occur, and to gain understanding of their effects on regional development and inequalities within and across regions.

It seems there are no fundamental differences hampering the integration of the main theoretical ideas and perspectives in the EEG and GVC literatures. Also global and longitudinal datasets are available to an increasing extent due to open science, digitalization of datasets, machine-learning techniques, and the enormous efforts of scientists to construct historical datasets such as the US historical patent dataset (Petralia et al., 2016) and the World Input–Output data (Timmer et al., 2015). However, a key challenge is the availability of detailed input–output data at the subnational scale (Los et al., 2017). A further obstacle to the integration of EEG and GVC is the almost separate worlds in terms of preferred methods (quantitative versus qualitative studies). It remains a challenge to convince scholars to appreciate the value of both research methods and to integrate them in their research (Yeung, 2021a). Moreover, there is a need to work on better methods and to explore the potentials for cross-fertilization using mixed methods. Network analysis might have the potential to bridge both research traditions. For sure, there is a need to integrate insights to get a more comprehensive understanding of new path development and uneven development in space. This would also give a boost to the EEG research agenda which has a tendency now and then to focus on the bright side of regional development rather than on the dark sides that include concerns about power asymmetries, negative spillovers, inequalities and uneven development (Hassink et al., 2019; Phelps et al., 2018).

A final research challenge is envisaging the design of policy strategies inspired by an evolutionary perspective on GVCs (Comotti et al., 2020; Dannenberg et al., 2018). Much of the recent work on policy in EEG claims that Smart Specialisation or innovation policies

need to be adapted to place-specific capabilities (Alshamsi et al., 2018; Balland et al., 2019; D'Adda et al., 2020; Freire, 2013, 2017; Uyarra et al., 2018). A challenge is to link these ideas to the GVC literature (Brennan & Rakhmatullin, 2015), and catching-up policies in particular (Lee, 2013, 2019). Another challenging question concerns the relationship with work in EEG on policy that focuses on regional lock-ins and traps (Boschma, 2022), such as being trapped in low-complex and low-value-added activities in GVCs (Phelps et al., 2003; Stöllinger, 2019). As Hartmann et al. (2021) have argued, middle-income countries are often trapped in a low complexity state, and only few parts of the world such as Taiwan have succeeded to overcome that situation. Pinheiro et al. (2021b) identified complexity traps at the subnational scale, studying the potential of low-, middle- and high-income regions to diversify in more complex technologies and industries. The question is still open as to how participation in GVCs plays a crucial role here, both as a potential cause of such traps and as a way out, and what types of policies would make sense to avoid or tackle such regional traps.

In sum, there is much potential merit in exploring further the nexus of EEG–GVC, in terms not only of policy implications but also of the many other open research questions outlined in this paper. Time has come to take up these research challenges.

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NOTES

1. Another critique by Yeung (2021a) was the prime focus of EEG on individuals and firms, rather than on non-firm actors. While this may apply to papers in EEG that focus on the geography of firm dynamics and regional diversification, it does not apply to the general framework of EEG that also includes the role of institutions and the state (e.g., Boschma & Frenken, 2006; MacKinnon et al., 2009; Martin & Sunley, 2006).

2. This critique is applicable to the broader literature of EEG only to a limited extent. In its foundational papers, the roles of networks and extra-regional linkages have been outlined (e.g., Boschma, 2004, 2005; Boschma & Lambooy, 1999). Boschma and Frenken (2010) connected the role of networks in EEG to the proximity literature and emphasized the crucial importance of interregional linkages to tackle regional lock-in. Empirical studies in EEG have also highlighted the importance of interregional linkages for regional growth (Boschma & Iammarino, 2009) and regional innovation (Barzotto et al., 2019; Breschi & Lenzi, 2015; Grillitsch & Nilsson, 2015; Miguelez & Moreno, 2015, 2018). There is also a large strand in EEG on clusters and networks that has referred to gatekeepers who connect to actors outside the cluster that are considered crucial for cluster evolution (Cantner & Graf, 2006; Giuliani & Bell, 2005; Graf, 2011; Morrison, 2008; Boschma & ter Wal, 2007), also in the context of the Global South (Giuliani et al., 2005; Iammarino & McCann, 2013; Morrison et al., 2013; Pietrobelli & Rabellotti, 2011).

3. Kano et al. (2020) mentioned the need for GVC studies to shed more light on the complex interplay between local capabilities and interregional linkages. This shows a resemblance to ongoing debates in economic geography about the importance of places and their connectivity for innovation. Access to non-local capabilities is often considered important when local capabilities and networks are underdeveloped (Fitjar & Rodríguez-Pose, 2011; Trippl et al., 2018). Scholars also suggest that both local and non-local linkages are

crucial for regional innovation (Ascani et al., 2020; Balland & Boschma, 2021; De Noni et al., 2017).

4. This would also shed light on another limitation of the GPN literature acknowledged by its proponents (Coe & Young, 2019; Yeung, 2021a), which concerns the limited use of the GPN approach to understand uneven development and inequalities in a global world (Phelps et al., 2018; Scholvin et al., 2021; Werner, 2019).

5. Most work in EEG has focused on Europe and the United States. To an increasing extent, studies of regional diversification in the Global South are starting to emerge. Petralia et al. (2017), for instance, showed that related diversification is important, especially in countries at earlier stages of development. This is confirmed by other regional studies in the Global South, such as China (He et al., 2018; Zhu et al., 2017), Brazil (Alonso & Martín, 2019; Françoso et al., 2022) and Vietnam (Breul & Pruß, 2022). Alonso and Martín (2019), for instance, confirmed that regional diversification is subject to a path-dependent process in Brazil and Mexico, but also that interregional and international linkages play a role.

6. In a comprehensive overview, Ambos et al. (2021) argued that the GVC literature lacks a systematic discussion of innovation and global knowledge sourcing. Instead, its main focus remains on the study of vertical supply chain linkages in different VC stages.

7. For instance, Crescenzi et al. (2014) and Crescenzi and Iammarino (2017) have investigated how MNEs make location decisions for their foreign activities at different stages of the VC.

8. Studies have looked at the relative importance of GVCs versus regional and local VCs (Keijser et al., 2021). This acknowledges the fact that VCs are not necessarily global of nature, which is especially relevant in the context of increasing South–South trade.

9. Giuliani et al. (2005) referred to upgrading when: (1) it involves entering higher unit value market niches or new sectors; and (2) undertaking new productive (or service) functions. In their seminal study, Humphrey and Schmitz (2002) made a distinction between four categories: process, product, functional and inter-sectoral.

10. Colozza et al. (2021) investigated the impact of external linkages (as proxied by a GVC participation index) on the economic complexity of regions. Using an input–output regionalized dataset of European Union NUTS-2 regions, they found that more complex regions benefit from GVCs, especially in manufacturing sectors.

11. Studies have also calculated an indicator of relatedness between industries using input–output data. For instance, Essleztbichler (2015) measured similarities of supplier–buyer relationships between industries to capture possible input–output externalities across industries.

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