

Clusters, Global Value Chains and Firm's Innovation

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Abstract

In this article we discuss the importance for production clusters and firms to continuously generate innovation if they are to sustain their long-term competitiveness in today's global economy. The study of the complexity brought about by globalization has been investigated by the global value chain (GVC) framework, which has improved the understanding of how clusters and firms compete globally. However, neither the cluster theory nor the GVC framework address firms' innovation through an explicit dynamic perspective and dedicate only partial attention to the role of entrepreneurial ventures. We draw elements from the developing entrepreneurial ecosystems literature to complement the cluster-GVC perspective and offer a finer-grained approach to the study of innovation in the global economy.

Introduction

Successful industrial clusters continuously refine their operational capabilities and pursue innovation to sustain their competitiveness over time (Buciuni and Pisano, 2018). This has emerged as an essential condition for their future prosperity and long-term sustainability. Others that fail to 'reinvent' themselves may fall into what Krugman refers to as the 'specialization trap'. Excessive specializing in a narrow set of production activities is deemed detrimental to the long-term competitiveness of mature industrial clusters (Narula, 2002; Hassink and Dong-Ho, 2005; Williams and Vorley, 2014) as this makes them vulnerable to others' comparative advantages. This threat is heightened as an increasing number of emerging economy production regions enter the global economic picture, commonly specialising in those same activities performed in advanced Western countries (Breznitz and Buciuni, 2015). To survive and prosper, mature production regions and firms have been left with little option but to evade the 'specialization trap' through relentlessly becoming innovative in new technological spaces (Boschma, 2015).

In order to generate innovation and survive in today's volatile economic scenario, it is fundamental for industrial clusters to tap into global value chains. Conceived in the late '90s as a new approach to investigate the ongoing global fragmentation of production (Gereffi, 1999), the global value chains framework (GVC), has had contrasting effects on the competitiveness of industrial clusters. On the one hand, the spread of GVC has increased the competitive pressure on industrial clusters and their firms, adding new low-cost competitors to the competitive landscape; on the other, however, GVC have provided traditional industrial clusters with the opportunity to partake in the global economy, acquire new competences and gather innovative inputs and ideas. As a result, instead of been seen as two alternative forms of industrial organizations, we contend that GVC and industrial clusters are two sides of the same coin, whose boundaries are increasingly intertwined and constantly changing over time and across space.

Understanding how firms in production regions develop innovation in a context of GVC requires a dynamic perspective and the assessment of the factors underpinning the generation of new products, processes and entrepreneurial ventures in both traditional industries and unknown technological spaces. The idea of evading the 'specialization trap' by absorbing or developing new competences in novel technology domains stems from a pivotal concept in economic geography, that is the evolutionary nature of economic systems (Klepper, 2002; Frenken, 2006; Martin and Sunley, 2015). However, to date, there has not been any systematic

attempt to assess the development of new competences and the generation of innovation at the intersection of industrial clusters and GVC through an explicit dynamic perspective.

In recent years, the ability of a production region and its firms to evade technology ensnarement and to generate innovation global economy has found support in the emerging form of entrepreneurial ecosystems (Isenberg, 2010; Ács et al., 2014; Autio et al. 2014; Ács et al., 2017; Spigel, 2017; Stam and Spigel, 2017; O'Connor et al., 2018). Entrepreneurial ecosystems are neither industry nor technology specific (Auerswald and Dani, 2017; Autio et al., 2018); in fact, their sustainability and evolution hinges on agnostic heterogeneity (Autio and Thomas, 2018). Entrepreneurial ecosystems thinking is founded on the assumption that entrepreneurs are responsible for pushing the boundaries of a given production region towards new geographical and technological trajectories. Entrepreneurs represent the aggregators and codifiers of new knowledge and competences, the triggers and enablers of innovation development (Schumpeter, 1911; Shane and Venkataraman, 2000), and the architects of new introductions into the market. More importantly, entrepreneurial ecosystems are by their nature dynamic and evolutionary, having an origin or antecedent and transitioning over time (Spigel and Harrison, 2018). Firms, industries or even clusters within a production region are subject to the finite nature of life cycles and eventual demise. For ecosystems however, expiration is not inevitable. Rather, the evolutionary processes of adaptation and mutation induce the diversity and heterogeneity that facilitates the sustainability and perpetuity of an ecosystem (Malecki, 2018; Roundy et al, 2017).

All in all, we contend that the entrepreneurial ecosystem literature can help us shed light further on the way innovation is carried out in the global economy. By adding an explicit focus on entrepreneurs as the triggers of innovation development, and proposing an evolutionary perspective to the study of the adaptation of industrial clusters to the global economy, the entrepreneurial ecosystem framework can strategically complement and advance the study of innovation in clusters and GVC.

Innovation in Global Value Chains

Over the past twenty years, the development of the Global Value Chain (GVC) analysis has profoundly changed the way scholars, practitioners and policymakers assess and understand the global economy. Conceived in the '90s on the cusp of the last wave of globalization, the GVC framework has introduced a new approach to the study of inter-firm transactions across borders, and more in general the organization of the global economy. One

of the major novelties introduced by the seminal work of Gereffi on *Global Commodity Chains* (1994) was the attempt to make sense of the growing integration of the global economy through an original lens of analysis, the value chain. Back in the '90s, the concept of value chain was not new *per se*, as it had been already introduced by the works of Michael Porter (1985) and Bruce Kogut (1985) in the previous decade; Gereffi's original contribution, however, originated from the analysis of the organization and governance of commodity/value chains across countries, hence introducing a radically new approach to the study of the international economy. This specific aspect of GVC analysis stemmed from and was enabled by the understanding that the global integration of markets was no longer limited to multinational corporations' foreign direct investment (FDI), but rather from the increasing spreads of global production networks, where inter-firm transactions were only partially coordinated through equity forms of governance (Gereffi et al., 2005).

As the value chain gained momentum as a new lens of analysis, new methodological and theoretical dilemma arose. Among them, the need to quantify the economic value generated and distributed in GVC and the comprehension of the micro dynamics underpinning firms' interactions and performances in GVC emerged as two of the most pressing ones. Especially in the field of business studies which, unlike economic studies, looks at the role of specific economic agents in influencing and shaping macroeconomic trends, the lack of reliable data about the value created in GVC and the performances of the agents partaking them emerged as a substantial methodological limitation. Overall, while through the use of the GVC framework we have been able to focus on the *meso* to explain macro phenomena characterizing the global economy, understanding how micro dynamics influence GVC remains largely uncertain to date.

The analysis of entrepreneurial firms is not new in the GVC field of study as they have been investigated by several scholars over the past fifteen years, particularly with respect to the issues of 'decent jobs' and the upgrading of small suppliers in underdeveloped economies. More precisely, of particular interest for the analysis proposed in this chapter are the works of Amighini and Rabellotti (2006) and Chiarvesio, Di Maria and Micelli (2010). Both articles had the merit to advance the understanding of the interrelation between local or district firms and GVC, paving the way for a milestone in the development of this specific branch of study, notably the publication of *Local Clusters in Global Value Chain* by De Marchi, Di Maria, and Gereffi in 2018. Common in all these contributions is the attempt to investigate the linkages

connecting local production territories to GVC and their impact on the evolution of both local clusters and GVC.

As the GVC and cluster framework are becoming more and more interrelated, understanding the implications for regions' and firms' competitiveness has become a central research topic in business, economics and regional studies alike (Cano-Kollmann et al., 2016; Lorenzen & Mudambi, 2012; Mudambi et al., 2017; Turkina & Van Assche, 2018). Of particular importance in this growing research stream is the analysis of the geography of innovation and its underlying dynamics. Although still quite underdeveloped in GVC, innovation has received growing attention in recent times, particularly thanks to the endeavours of business scholars. Key in the current debate on innovation in GVC is the understanding of the impact of the coordination of pre- and production activities on firms' innovation capabilities. Two lines of reasoning have emerged: on the one hand, scholars like Dedrick, Kraemer and Linden (2010) and Vivek, Rickey and Dalela (2009) argue that the disentanglement of R&D and production functions has little or no impact on firms' innovation potential. In fact, by delegating low value-adding activities to global GVC partners, leading firms free up resources which they can devote to innovation activities. Opposing this view is the co-location argument, which sees the geographical proximity of R&D and production as a fundamental aspect of firms' innovation strategy (e.g. Ketokivi and Ali-Yrkkö, 2009; Pisano and Shih, 2012; Buciuni and Finotto, 2016).

Although sustaining opposite arguments, both these views contribute to explain the dynamics underlying innovation development at the intersection of GVC and local production systems. As these two systems are increasingly becoming intertwined, the study of innovation dynamics will require addressing them both through a converging research perspective (Scalera et al., 2017).

Industrial Clusters Under Globalisation

Production of both goods and services has significantly changed since the 1980s, and traditional models of industrial organizations have evolved into new paradigms. The challenges for the “classical” industrial clusters model and the emergence of new models of industrial organizations have been accelerated by the international fragmentation of production (Arndt and Kierzkowski, 2001) and the diffusion of globally dispersed value chains (Gereffi et al. 2005). Central to the classical logic underlying the GVC framework is the role of lead firms, in this case multinational corporations (MNCs), in stimulating and shaping the global

fragmentation of production with their growing use of lower-cost foreign suppliers, which specialize in specific production stages. The specialization of locales in discrete phases of production is one of the main implications of the GVC framework, which aims to provide a finer understanding of the spatial and structural dimensions of global networks.

On the one hand, the GVC framework seems to augment the classical logic behind localized production regions: activities along production networks are now routinely done by companies specializing in narrower sets of activities, from high-level R&D to design, manufacturing, and assembly techniques. Further, the detailed codification of each task coupled with rapid advancement of ICT, decrease in transportation costs, and political processes creating a much more open trade system, mean that these diverse tasks no longer need to be co-located (Gereffi, 1999). Followed to its logical end, increased global fragmentation suggests that since each stage necessitates different capabilities, each locale should specialize in a narrow set of activities in order to become world class and an innovation hub (Breznitz, 2007). These developments led different locales, such as China, Taiwan, and Israel, to specialize not only in specific industries, such as semiconductors, but also in particular stages of production in these industries, such as R&D, fabrication, or assembly (Breznitz and Murphree 2011). As a result, while the intersection between MNCs and new global producers forged a new model of industrial organization – more narrowly specialized in specific stages or phases of production – numerous traditional production regions in Western economies faced a situation of eroding competitive advantage. As a result, many of them have either declined or evolved to have a more narrowly stage-specific focus, hence supporting a tendency toward a specialism around firms' activities in the production region. This represents a vulnerability to either technological disruption or cheaper production region options from emerging economies around the same specialism.

The competitiveness of production regions in a world of GVC has been incrementally investigated in recent years and has advanced our understanding of the interplay between local and global dynamics (e.g. Buciuni et al., 2014; Buciuni and Pisano, 2018; De Marchi et al., 2017; Perri et al., 2017). Recently, a significant proportion of these studies have focused on firms' strategies and operations management, hence complementing a research domain traditionally dominated by scholars interested in industry-wide dynamics, such as industrial districts, clusters, and production networks. By adding a more explicit focus on the role played by individual firms in bridging the local and global dimensions, business scholars have enriched their research field too with a more holistic and systemic approach.

Curiously, however, there has not been any systematic attempt at investigating the heterogeneous evolution of production regions and GVC from a dynamic perspective. On the one hand, the use of real time longitudinal data remains uncommon, thus making it difficult to track the evolutionary paths of industrial clusters over time and across space; on the other, while a more explicit focus on firm-level analysis has been added, the bulk of studies tend to focus on leading firms as their prime unit of analysis (Morrison, 2008; Buciuni and Pisano, 2018). In the context of industrial clusters, where the generation of new entrepreneurial firms has long been deemed a key mechanism for the emergence of agglomerated industries and the generation of innovation, this emerges as a substantial limitation in this specific research field. Recently, however, a new body of research and policy has emerged that endeavours to rectify this deficiency by placing the study of entrepreneurial firms centre stage in the evolution and innovation dynamics of industrial clusters. This field of ‘entrepreneurial ecosystems’ considers the key role played by new enterprises in the capacity of industrial regions to generate innovation and compete in today's global economy.

The Contribution of Entrepreneurial Ecosystems

The entrepreneurial ecosystem perspective represents a more holistic and finer grained approach to studying the evolution of a production region and its underlying mechanisms (Cohen, 2006; Isenberg, 2010; Stam, 2015; Audretsch and Belitski, 2017; Stam and Spigel, 2016; Stam and Van de Ven, 2019). An entrepreneurial ecosystem generally operates on a grander scale and scope than a conventional industrial cluster and is commonly industry and technology agnostic (Auerswald and Dani, 2017; Autio et al., 2018; Malecki, 2018). Among the features that define the entrepreneurial ecosystem framework, the notion of sustainability has been at the core of this novel research discipline since its early developments (Cohen, 2006). An ecosystem's sustainability derives from the introduction of heterogeneous variation and adaptation that can extend an entrepreneurial ecosystem's lifespan (Boschma, 2015; Colombelli et al, 2019; Roundy et al., 2018; Malecki, 2018; Spigel and Harrison, 2018; Ryan et al., 2020). As a result, the resilience and long-term competitiveness of an entrepreneurial ecosystem springs from coherency around specialism in its early existence (Roundy et al., 2018; Spigel and Harrison, 2018) and heterogeneity from the later diversity introduced by new firm formations across multiple technologies (Malecki, 2018). The combination of these two dynamics is what generally leads to the development of new technological solutions and new entrepreneurial ventures in both related and unrelated industrial domains.

An entrepreneurial ecosystem is rooted in place with a relatively distinct geographic boundary within which is contained mutually dependent components (Auerswald 2015; Stam 2015; Brown and Mason 2017; O'Connor et al. 2018; Adams, 2020). These have dynamic evolutionary processes of selection, variety and adaptation (Boschma 2015; Roundy, Bradshaw and Brockman, 2017; Malecki 2018). Bounded dynamic entrepreneurial activity encompasses local culture, the decision-making, firms' growth and individual traits (Feldman and Kogler 2010; Audretsch and Belitski 2017). Even under conditions of localness, global connectivity is important for the success of local entrepreneurial ecosystem under the auspices of modern globalisation. The successful local ecosystem can serve as a global pipeline for entrepreneurs in the region. It is useful for future research to understand the external mechanisms that enable valuable resources and knowledge to flow into, and out of the ecosystem, thereby promoting its evolution and continued sustenance.

From an evolutionary perspective, the essence of place can change over time as boundaries may shift and scale expands. Indeed, growth by its very nature implies evolutionary processes. Existing studies suggest that there are multiple evolutionary pathways for entrepreneurial ecosystems. The creation and evolution of an entrepreneurial ecosystem can be organically entrepreneur-led (Feld, 2012); alternatively and possibly simultaneously, it can be guided by the visible hand of Government (Fuerlinger et al., 2015; Adams, 2020), or even anchored by large corporations (Neck et al., 2004; Mason and Brown, 2014; Colombo et al., 2019; Bhawe and Zahra, 2019; Ryan et al., 2020) and universities (Hayter, 2016; Miller and Acs, 2017; Cunningham et al., 2019; Johnson et al., 2019; Nicholls-Nixon et al., 2020). Additionally, an entrepreneurial ecosystem can mutate from a pre-existing system such as an industry cluster (Pitelis, 2012; Autio et al., 2018), or set of co-located clusters of varying vintages, through technological convergence in related and unrelated branches (Auerswald and Dani, 2017). For instance, Ryan et al. (2020) empirically illustrated how a strong, resilient entrepreneurial ecosystem could emerge from the metamorphosis of an antecedent industrial cluster, primarily via MNE spinouts, and lead the evolution of an entire production region through the generation of innovation.

Regardless of the specific evolutionary path an ecosystem can follow, incumbent entrepreneurs and corporate or institutional spillovers generally play a key role in the development of entrepreneurial ecosystems. Pioneer entrepreneurs that either serially start more firms or successfully exit their initial venture, serve to activate an entrepreneurial ecosystem's ongoing growth and renewal. They do so as role models, mentors and even angel

financiers that channel their resources, time and energy into its perpetuation (Mason and Harrison, 2006; Mason and Brown, 2014; Ryan et al., 2020). Spillovers can serve to propel and expand the evolution of an entrepreneurial ecosystem, primarily by building on and expanding the accumulation of knowledge at local level (Van de Ven, 1993; Agrawal and Cockburn, 2003; Breschi and Lissoni, 2003; Clarysse et al., 2014; Harima et al., 2020; Ryan et al., 2020).

Larger enterprises, both indigenous and inward investors, can serve as the breeding grounds of local entrepreneurship in several domains. They can contribute and catalyse an entrepreneurial ecosystem's creation and growth by taking the role of incubators and stimulating the spinout of innovative high-tech start-ups in related and unrelated varieties (Klepper, 2007; Brown and Mason, 2017; Spigel and Harrison, 2018; Ryan et al., 2018). As such, large firms act as 'knowledge integrators' within the entrepreneurial ecosystem and facilitate the codification and absorption of new knowledge at local level and provide connectivity to new global market opportunities for indigenous firms or aspiring entrepreneurs (Bhawe et al., 2019; Buciuni and Pisano, 2018).

Towards a New Research Perspective

The literature review proposed in the previous sections has highlighted the importance to investigate firm's innovation through a multidisciplinary perspective. Drawing on industrial clusters, GVC and entrepreneurial ecosystems, this chapter underscores the need for mixing elements from different disciplines in the study of a complex phenomenon like firms' innovation in today's global economy. Particularly for production regions and firms, whose sources of competitive advantage still hinge on their ability to arrange and orchestrate complex value chains, and is influenced by the ever-changing rules of globalization, drawing on a single lens of analysis might not suffice. Recognizing this constraint, in recent years we have witnessed the growing intersection of two separate yet interdependent theoretical frameworks - notably industrial clusters and GVC - and the genesis of a well-defined body of studies. Central to this new line of research is the analysis of the competitiveness of clusters and firms in a context of GVC. Innovation, however, has only received partial attention to date, hence suggesting the existence of a substantial room for further research. Existing research has mostly investigated the relationship between pre- and production activities in GVC, and whether their separation or co-location affect firms' innovation strategy and capabilities.

Despite advancing our understanding of the dynamics sustaining firms' innovation in the global economy, neither the cluster theory nor the GVC framework propose an explicit focus

on the micro foundations underlying innovation. Mostly concerned with a *meso* level of analysis, both these research approaches have seldom investigated the role of entrepreneurial firms in innovation development. While we recognize that a growing number of studies has been lately adding an explicit analysis of the way leading firms compete at the intersection of GVC and local clusters, little is still known about how entrepreneurial firms partake in and contribute to innovation development. Entrepreneurial firms have been shown to be at the forefront of industries' evolution, generating innovation in new market niches and technological domains that larger firms generally overlook.

A second and related area for further research in the study of innovation concerns the use of a more dynamic perspective. Innovation is in fact a dynamic phenomenon by definition, whose development cycle might last several years and include numerous actors in multiple geographical locations. As a result, we contend that the understanding of innovation development in the global economy requires a dynamic perspective, that can allow tracking and assessing the micro foundations underpinning innovation over time and across space. To date, very few research in cluster and GVC studies have assessed firms' competitiveness and innovation through a real time longitudinal approach, hence limiting our understanding to a rather static research perspective.

Both the need for a finer-grained level of analysis and a more dynamic perspective of innovation development can be tackled through the use of a relatively new lens of analysis, the entrepreneurial ecosystems framework. Central in this research approach is the role of entrepreneurs as triggers of innovation development and engines of industries' evolution. The use of entrepreneurs as prime unit of analysis allows the comprehension of the micro dynamics whereby a production cluster can evolve into new technological domains and generate innovation in novel market niches. Through spinoffs and spinouts, entrepreneurs use local knowledge and mix it with new competences and ideas to generate innovation. While local knowledge is typically embedded in long-established cluster firms, new innovative inputs can come from the global economy and are transferred into local production systems through GVC. Mixing local and global knowledge, entrepreneurs can be seen as the glue that sticks together different pieces of knowledge and gives shape to innovative business models, products and processes.

Overall, while drawing on the expanding entrepreneurial ecosystems literature can enhance our comprehension of how innovation unfolds in today's global economic scenario, we by no means suggest that this research framework should supersede the use of cluster theory

and GVC. Rather, we contend that it is only by using these three distinct lenses unitarily that we can fully grasp the complexity underpinning innovation in the global economy. The recent combination of cluster theory and GVC has enabled a finer analysis of the geographical and organizational arrangement of industrial processes in today's economic landscape; the addition of the entrepreneurial ecosystem framework offers a complementary perspective to investigate the micro foundations of innovation development.

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