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Local and Regional Development in Global Value Chains, Production Networks and Innovation Networks: A Comparative Review and the Challenges for Future Research

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ABSTRACT *Globalization as a process has developed exponentially over the past 20 years, generating multiple and opposite effects for local and regional development (LoRD). This has created both new opportunities as well as raising new threats for local actors, both public and private. This special issue sets out to consider the prospects for LoRD in this context. Our aim in the introductory article is to consider how globalization may bring about LoRD. We do this through a comparative review of three critical analytical frameworks that have been used in recent years to examine the changing dynamics of globalization and their consequences for local production systems, namely global value chains, global production networks and global innovation networks. We provide an overview of these distinct approaches, identifying their strengths and weaknesses. Our argument is not that any one of these approaches is necessarily “better” than the others, but rather that to formulate a more complete and dynamic territorial perspective on regional development in the context of globalization, there needs to be an attempt at (eclectically) integrating the elements of these three distinct frameworks. The article then goes on to show how individual contributions in this special issue push forward this agenda, drawing on these distinct analytical frameworks to consider the transformative prospects for LoRD.*

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Introduction

The globalization of markets has sharply increased over the past 20 years. This trend has multiple and opposite effects on the prospects for local and regional development (LoRD). It may create new economic opportunities (through, for example, productive investments, research and development (R&D) alliances, knowledge absorption, and the emergence of new consumers) and it may raise new threats (such as the relocation of production activities, firm closures, employment losses, brain drain, among others). In our view, the traditional perspective of regional economists offer rather circumscribed types of analysis on local production systems, small firm clusters and industrial districts. These are no longer sufficient to explain the features, limitations and potentials for the growth of local economies in an increasingly globalized era and need to be substantially revised. This is not a new criticism. Various approaches have emerged in recent years seeking to explore the emergent linkages between the local and global terrains. Our main aim in the introductory article to this special issue is to understand how globalization can bring about LoRD. We do this through a comparative review of three critical analytical frameworks that have been used in recent years to examine the changing dynamics of globalization and their consequences for local production systems, namely global value chains (GVCs), global production networks (GPNs) and global innovation networks (GINs). We provide an overview of these distinct approaches, identifying their strengths and weaknesses. Our argument is not that any one of these approaches is necessarily “better” than the others, but rather, that to formulate a more complete and dynamic territorial perspective on regional development in the context of globalization there needs to be an attempt at (eclectically) integrating the elements of these three distinct frameworks.

A number of sociologists and economists in development studies have sought to explain the nature of globalized linkages between firms and globally dispersed suppliers using the framework of GVCs (Humphrey & Schmitz, 2002; Gereffi *et al.*, 2005). On these bases, they have identified a typology of linkages between lead firms and suppliers in value chains that include hierarchical, captive, relational, modular and market governance patterns. These patterns in turn depend upon three main factors: supplier competences, knowledge codification and transaction complexity. Within this framework, some have argued that local development is linked to the nature of ties developed in GVCs (Humphrey & Schmitz, 2002).

Another group of scholars, from an economic geography perspective, have developed frameworks that help explain the global dynamics of firms and trans-national production systems and the articulation and disarticulation of production networks across different sub-national regions. They do so by taking into account more widely the institutional and cultural features and constraints of different territorial ensembles, as well as the explicit policy approach taken by states and institutions, which seek to develop their own competitive positions (Ernst & Kim, 2002; Yeung, 2007, 2009; Coe *et al.*, 2008).

The current global economic crisis adds complexity to this debate as these frameworks need to be both particularly flexible as well as continuously revised in order to capture the emergence of abrupt changes that modify current production, commercialization and innovation dynamics at the global scale. This editorial article will help the reader in two ways. First, this work (and the special issue as a whole) offers a comparative discussion of the theoretical and methodological instruments through which these key analytical frameworks (GVCs, GPNs and GINs) are adopted as a means to interpret the current dynamics

of globalization and its implications for LoRD. We attempt to compare them and, simultaneously, underline advantages and limitations of such theoretical and methodological approaches. Taken together, we hope to set out the analytical challenge that academics and policy experts face vis-à-vis the analysis of regional development processes and prospects. Second, this work seeks to visualize the core features of these three frameworks that are particularly relevant for analysing LoRD within the increasingly competitive international markets in which any firm and local production system can either integrate (e.g. representing new market opportunities) or exit (e.g. as a result of global competition).

In the next section, we briefly introduce the academic evolution of the three conceptual frameworks, and then open the context for a thorough discussion of their critical features. In section 3, we take into consideration a range of relevant criteria in which the three approaches differ, and discuss their strengths, weaknesses and limitations. In section 4, we specify the position of each of these frameworks in the analysis of LoRD in an era of globalization. Moreover, we formulate an integrative framework in order to sketch out the basic features for the analysis of the future prospects of LoRD. The concluding section presents the added value of this contribution and an overview of the articles included in this special issue.

Historical Antecedents of Perspectives on Global Development Dynamics

A first step towards our theoretical synthesis requires a brief discussion of the historic process of internationalization of markets and the creation of frameworks that have set the scene for our current understanding of globalization (see also Hess & Yeung, 2006; Bair, 2009). For decades, many trade theorists, political economists and world-system experts have emphasized the importance of analysing the unequal industrial and market exchanges that led to the creation of core, semi-peripheries and peripheries (Prebisch, 1950; Singer, 1950; Hopkins & Wallerstein, 1977; Frank, 1978). These unequal relationships have either perpetuated themselves despite relevant changes in organizational patterns, or, as some have more recently suggested, are going through structural modifications due to the emergence of new hegemonies (Henderson & Nadvi, 2011). One critical strand in current debates on globalization has been the relationship between local and global actors, the nature of governance within these ties, and their implications for local policy (Held & McGrew, 2002; Henderson *et al.*, 2002; Schmitz, 2004). The creation of the *filiere* framework by the French school of territorial development (ADEFI, 1985) as well as the Michigan-based subsector approach (Boomgard *et al.*, 1992) explicitly attempted to bring together the understanding of the local development of firms (sometimes even local production systems) and the increasing importance of international markets (including actors managing the final phases of distribution and commercialization). These analytical attempts were the precursors to the GVC and GPN approaches and provide early insights into both a sectoral and an internationally integrated perspective on local industrial development processes.

Later on, in the 1990s, new theoretical frameworks emerged to take academic research several steps further in the understanding of the globalization of local production and innovation dynamics. Gereffi and Korzeniewicz (1994) developed the global commodity chains (GCC) approach which represented the academic evolution of the former concepts and paid special attention to global governance dynamics. They argued that local suppliers within some market chains were controlled or driven by downstream

actors (e.g. distribution chains in food or apparel industries), while others were organized by lead manufacturers (and also the technology leaders) who drove production and influenced market dynamics in capital-intensive industries (e.g. pharmaceutical and aircraft companies).

In the early 2000s, new efforts by this group of GCC researchers resulted in an upgrading of their analytical framework with the creation of the GVC concept. The GVC concept explicitly identified the nature of value generation along each step of the chain. It also recognized that such value-creating chains were not restricted solely to commodities but could extend across manufacturing and indeed to services. Gereffi *et al.* (2005) also underlined that identifying the nature and basis of value creation along each stage of the GVC required a conceptual framework that provided a deeper analysis of the governance dynamics within the chain. This resulted in a shift from the buyer/supplier-led chains in the GCC perspective to the five governance typologies within GVCs (Gereffi *et al.*, 2005). The nature of governance, or power, within the GVC relationship determined not only the process of adding and distributing value along the chain but also the possibilities of upgrading and thus of transformation from one type of GVC to another. As described by Bair (2005, p. 158), this GVC approach moves away from the “developmental disillusion” of many world-system experts who did not see any scope for a change between the centre and the periphery in the global economy without revolutionary upheavals in such ties. Both GCC and GVC suggest that there is both opportunity and possibility for dynamic and positive change once appropriate conditions and measures are put in place. Consequently, Humphrey and Schmitz (2002), and others, developed these frameworks further by applying the value chain concept to local and regional production systems, including local industrial clusters, in both developed and developing countries (see also Nadvi & Halder, 2005; Pietrobelli & Rabellotti, 2007) as a means to identify the potential for growth and development of such local economies, their SMEs and institutions in the context of international markets and global interactions.

A different but related framework was simultaneously developed by Ernst and Kim (2002) and Henderson *et al.* (2002), and later refined by Coe *et al.* (2008) and Yeung (2009) from an economic geography perspective. This framework helps to depict the composition of sector and multinational networks and the international economic transformations that occur in such markets in relation to specific national industrial policy approaches that stretch from open market perspectives to inward oriented indigenous/endogenous innovation approaches. More specifically, even though different GPNs are spanning the global economy and drawing different clusters and regions closer together in a new form of international division of labour, we continue to observe spatial differentiation in the location of different firms and their production networks on a global scale. In theoretical terms, there is indeed an intricate link between GPNs and industrial clusters. We can therefore think of GPNs as a globalized/decentralized phenomenon and industrial clusters as a localized/concentrated constellation of different configurations of GPNs. The former operates on a global scale and is constantly searching for better production locations, whereas the latter is developed to “bring down” and “localize” this highly globalized production activity. For GPNs to work and prosper, there must be good “network economies” to be reaped from spatially differentiated production arrangements. For industrial clusters to emerge and sustain, both local and non-local links are highly important. Local links refer to localized assets in specific territories

such as institutions, labour, and capital formation. Non-local links point to flows of knowledge, people, and capital exogenous to these industrial clusters. They are critical to the formation of industrial clusters insofar as they bring in new learning, markets and technologies

A third approach that has been more recently developed (Ernst, 2009; Cooke, 2011) emphasizes the emergence of GINs, and their implications for local-global production inter-relationships. This framework stresses the critical relevance of specific high value-added activities including dispersed engineering, product development, and research activities across geographic frontiers. The balance of power in international production and market dynamics depends very much on these activities. In fact, production has become increasingly outsourced, whereas lead firms try to retain and/or control R&D networks and activities that affect their core capabilities, learning and innovation processes on a global scale. Even though this is in line with the literature on transnational corporations, the new emerging powers (mainly Brazil, Russia, India, Mexico and China (BRIMCs)) are increasingly joining R&D activities in the form of specialized R&D departments within multinational groups and/or within their own multinationals that benefit from a thick flow of expert managers and scientists coming back from western countries after an intense period of preparation and research practice. This process implies a catching up in R&D and innovation capabilities that are likely to change the global balance of power even more strongly over the next decade.

For years, these frameworks were mostly rooted in the analysis of regional/local development in developing and/or emerging economies; however, current academic work increasingly tends to abstract from it and focus on firms and their global networks. A substantial part of this literature may reorient its objectives to follow the route of the earlier literature on multinational companies (Dunning, 1988; Cowling & Sugden, 1997; Blomstrom *et al.*, 2000; Dunning & Lundan, 2008; among others). More recently, this literature has focused on the history of large conglomerates that control R&D and innovation processes and the related production networks that determine the growth prospects of specific industries and large trans-border territories.

Overall, the fundamental insights offered by these distinct analytical frameworks might lead to a partial picture of global innovation, production and market dynamics that describe the strategies and the success achieved by an elite class of firms and a small number of lead firms that benefit from being integrated into such privileged chains and networks. Additional thinking is needed to understand the competitive position and prospects of regions within this globalized scenario by identifying the relevance of these key activities and processes (i.e. R&D, innovation, production and market) for regional development. This analysis requires taking a particular geographical approach, in other words viewing regions from a country-specific and localized perspective due to vastly different interpretation of territorial geographies. In countries such as the US, China and Brazil, the regional space might refer to aggregates of states such as the South of Brazil or the North-East of the US or the Pearl River Delta in China, where hundreds of millions of people live and work. In the case of Europe and other less federal states, the regional dimension is quite small in geographical terms and epitomizes specific histories, cultures, social and political traditions that affect the way of doing business and thus represent meaningful geographical units of analysis.

To date, the responses by Schmitz (2004), Pietrobelli and Rabellotti (2007) and on a broader “regional” basis by Yeung (2009), or by Asheim *et al.* (2008) with their analysis

of regional competitive advantages based on the related varieties approach, or even by Foray and the European Commission with their work on “smart specialization” (Foray & Van Ark, 2007), are going in this direction and set the scene for the papers presented in this special issue. More work is needed to integrate the richness of these related yet distinct analytical frameworks (GVCs, GINs and GPNs), focusing in particular on identifying key drivers for regional development in the context of push and pull forces within global markets and production and innovation systems.

A Comparative Review of Three Global Analytical Frameworks

In Table 1, we compare the three analytical frameworks on globalization processes, highlighting their main differences and discussing their usefulness for identifying and analysing the processes of regional development. In particular, a set of criteria is taken into account: scientific discipline and reference literature, analytical focus and main unit of analysis, types of agents involved and relationships among them, governance, regional upgrading, and measurability and assessment. Such criteria are not identified on the basis of a specific model or deductive analytical structure, but rather on the basis of significant differences that can be identified from an inductive analysis of these theoretical frameworks and their empirical applications.

Table 1. Comparative features of GVC-GPN-GIN for local/regional development

No.	Criteria	GVC	GPN	GIN
1	Scientific discipline	Economics and sociology (mainly)	<i>Multidisciplinary (economic and political mainly)</i>	Economics and business
2	Reference literature	Business, economics and development studies	<i>Economic geography</i>	Industry and innovation studies
3	Analytical focus	<i>Value creation and distribution</i>	<i>Production network dynamics</i>	<i>Innovation network and innovations</i>
4	Main unit of analysis	Firms (indirectly on sectors/ industries)	Firm/sector/industry	R&D departments, firms and industries
5	Types of agents involved	Firms	<i>All types of agents and institutions</i>	Firms and institutions/ organizations
6	Relationships among agents	Chain/linear	<i>Network/systemic</i>	<i>Network/systemic</i>
7	Governance	<i>Well-defined typology</i>	Not explicit	Not explicit
8	Regional upgrading processes	<i>Product, process, function and sector</i>	Strategic coupling	<i>Innovation types (i., m., r. a.), and position in the GIN</i>
9	Measurability	Tracing cost/value per phase/ operation	In broad terms (turnover/ GDP) per industry or firm-specific variables	None, though feasible by adapting CSI work

Note: In italics the strength of each approach from a “regional development” perspective.

Scientific Discipline and Literature of Reference

The discipline of reference (2) is relevant. GVC work, which originated in international business studies, has been most effectively developed within the sociological and development studies literatures, where it has been used to focus on governance and economic power dynamics and its consequences for the development prospects of small-sized suppliers based in developing or emerging economies (Boomgard *et al.*, 1992; Gereffi & Korzeniewicz, 1994; Gereffi *et al.*, 2001). The other two frameworks (GPN and GIN) also have multifaceted origins. They include a mix of business, economic and political perspectives that go beyond the view of the individual lead firms and their suppliers and take into account wider economies integrating hundreds of firms specializing in different functions and located in various parts of the world and, yet, are interconnected within tight or loose production and innovation networks. In particular, in the case of the GPN approach, this proceeds from a literature that is very much consistent with the analysis of regional specializations and positioning within continuously changing competitive markets in economic geography. The GIN analytical framework, however, derives its instruments from the discipline of business and economics studies (such as the GVC approach), although it has a clear focus on innovation and contributes to industry and innovation studies as the main reference literatures.

The Academic Focus

The academic focus (3) varies in the three approaches. The GVC approach engages in the discussion of trans-border value creation and distribution as a means to understand the creation and retention of value by selected companies in the production and commercialization process vis-à-vis other companies, mostly suppliers, service providers and clients, but not competitors. This operation goes hand-in-hand with the analysis of the governance patterns at work in the value chain between vertically interacting parties. However, little can be extracted from the GVC analysis on the impact of these chains on the wider territories and production systems within which such chains are located. Its lineal approach interconnects one firm with another or with a group of other firms in supply or subcontracting relationships rather than systematizing relationships and effects on wider territorial ensembles of firms. Echoing the subsector analysis (Boomgard *et al.*, 1992), GVC could be replicated or extended to a number of parallel channels (or GVCs) and, in this way, open up a wider discussion on the differentiated impact they can have in specific territories where a relevant number of suppliers and subcontractors are located. However, in order to achieve this objective, the GVC framework needs to be combined with the analysis of clusters, as done in theoretical terms by Humphrey and Schmitz (2002), and more empirically by, among others, Knorringa (1999), Nadvi and Halder (2005) and Pietrobelli and Rabellotti (2007).

The focus of GPN is trans-frontier production networks (rather than systems). This is quite easily identifiable and relevant in the context of the automotive industry or the ICT and electronics industry. It becomes less meaningful in the context of more lineal industries such as food commodities where often production processes are localized in the country of origin (with final elaborations or adaptations to the consumers in the country of consumption, such as horticulture, floriculture and foodgrains). This approach is more likely to be used in order to describe the changing regional and national landscapes

of industries¹. It is what Yeung (2007, 2009) did by assigning different forms of strategic coupling (i.e. strategy based on the combination of spatial, technological and organizational fixes) to different East Asian regions: “indigenous innovation” to Metropolitan Korea, Taiwan and Singapore in automobile and transportation industries, “international partnership” to Singapore and Taiwan in finance, petrochemicals, electronics and logistics networks, and “production platforms” to Malaysia, Thailand and most export (coastal) regions of China.

The third approach is the GIN, which focuses on trans-frontier innovation networks. This approach takes a very focused view of innovation dynamics in search of the most relevant relationships that have an impact on medium to high-tech production activities. In general, this framework concentrates on both innovation processes (incremental, radical, modular and architectural) and on the innovation roles played by different actors in the network (Ernst, 2009). Because of the great importance that innovation has acquired in promoting economic development over the past 20 years (Cooke, 2001), the GIN becomes a strategic framework for the analysis of current and future trends and leaderships in the globalized economy. In particular, the GIN offers more opportunities to extend and upgrade the overall production pattern cultivated in any region, particularly when it is combined with the analysis of the potentials for innovation across related varieties (Asheim *et al.*, 2008).

The Relevant Unit of Analysis

A key methodological dimension in the comparative analysis of the three frameworks refers to their different units of analysis. The GVC approach focuses on the firm(s) as each value chain comprises a very specific set of firms in relation to their supply of systems, components and materials, subcontracting of phases, service provision and sale of products (Bair, 2005, p. 166). In spite of the general objective to analyse and verify the possibility for regions and countries to upgrade their competitive position in global markets (Gereffi & Korzeniewicz, 1994), the GVC approach generally focuses on only a limited number of firms, those that participate in each value chain, and dismisses any other firm or group of firms that compete or simply do not work with the selected lead firms.

In contrast, the GPN approach takes a broader sector or industry approach. Although it identifies the key lead firms, as the GVC analysis does, it does not stick to these alone, but extends its analytical approach to networks and clusters or country groups of firms that supply or subcontract part of the production. In this sense, it takes a territorial approach which is then integrated into the sector/industry approach. In this case, the territorial approach is quite wide as it does not refer to the kind of regional prospect that is often envisaged in European studies, but rather more from the perspective of larger regions, such as those conceived in larger geographical landscapes. For this reason, typical GPN analyses take into account GPNs and regions that integrate several countries (for example, in Yeung, 2009; Yang, 2012, in GPNs across East and South-East Asia). It is a clear trans-border and cross-country kind of regional perspective.

For the GIN approach, the unit of analysis is both the firm (and the R&D department within the firm) and the industry to which it belongs (Ernst, 2009; Cooke, 2011). Again, it is a very specific approach to inter-firm industry relationships that go beyond firm boundaries and national borders to take into account homogeneous or integrated

groups and networks of firms and industries that shape technology and competition features of any industry and market on a global scale. Such methodological dualism can be tackled with nested case studies that offer the opportunity to collect and discuss critical information on two sets of actors as well as to maintain and to manage a very open approach to innovation dynamics derived from such agent's multiplicity.

Simple or Complex Linkages and the Range of Relevant Actors

One very important aspect of this comparative analysis is the kind of relationships envisaged within each of the three frameworks. The GVC approach takes a quite identifiable linear perspective. Despite the potential feedback effects running along the value chain from downstream to upstream phases, the value chain is in general identified on the basis of lineal relationships that depart from the origin (the lead firm) and are further divided into a limited number of parallel, competing, secondary channels leading to suppliers and subcontractors or service providers. In this hierarchical relationship, channels further down the value chain are often less essential to the lead company because they are the so-called first, second, third and fourth-tier suppliers. In this way, the GVC framework offers the possibility of controlling and/or assessing the flow of inputs and outputs passing from one firm to another (and vice versa within feedbacks loops). The approach helps obtain measures of efficiency and effectiveness, which a more thorough but less linear approach cannot easily produce.

However, this rather linear approach is possible especially because the main actors taken into account are firms. Other types of actors may be mentioned, but are not measured and assessed in their relationships and impact on localized economic activities. In their recent paper, Pietrobelli and Rabellotti (2011) conclude that the relationship between actors in local innovation systems and GVCs varies widely in relation to different forms of governance and thus is nonlinear and co-evolutionary. Cluster and/or industry associations, chambers of commerce, authorities in charge of specific infrastructures such as ports, highways, airports, science parks, technology centers, research excellence centers, universities, among others, and finally local, national and supranational governments and institutions also matter, though the GVC framework does not specifically take them into account as their integration would require a much more "systematic" (but then less business-oriented) approach to the analysis of globalization dynamics.

In this regard, the GPN framework takes a more inclusive network approach, and therefore offers the possibility of identifying and understanding the multi-scalar relationships that operate among firms and countries in specific industries and markets. It is open to the need to take a broader approach that includes not only inter-firm relationships, but also public/private and private organizations and sector/cluster-government relationships. In addition, it also opens the possibility of integrating wider levels of analysis, including social, cultural and institutional factors among others, to the understanding of territorial dynamics. Of course, this strength of "inclusivity" might be problematic—as we will see in our discussion on measurability, but it remains a crucial aspect and a potential advantage of this analytical framework vis-à-vis the GVC approach.

Notwithstanding this, the GPN approach still refers to network dynamics rather than system dynamics or, more likely, to smaller systems such as those driven by global lead firms. In conceptual terms, the concept of "systems" integrates a wide range of actors that mutually interact and coordinate horizontally through equal and balanced power

relations (Lundvall, 1992). As a consequence, such “networks” (GPNs) cannot be directly identified with “systems” and for this reason cannot fully serve as the analytical perspective of LoRD.

The GIN framework offers a similarly broad type of approach, less linear and more complex. In this case, the discussion about the similarity between system and network approaches is worthy of note, as the former does automatically include the latter, but not vice versa. Complexity does not help when quantitative measurement and assessment of these dynamics and their impact on production and innovation processes is needed. However, the GIN approach may offer a more qualitative, holistic (but also nested in cases) view and assessment of the effects that the network has on firms and production systems, especially at the national level. In addition, the GIN may offer a forecast of future developments of the industry at the global level, and in particular, of the innovation activities that will define leadership and competition trends in the coming years.

Governance

An important criterion for our comparative analysis is “governance”. The three approaches differ substantially in this respect. The GVC approach is the most explicit in taking this criterion into account. Analysing the nature of asymmetrical power relationships between international lead firms and their globally dispersed suppliers is central to the GVC analysis, with implications for value creation, value appropriation, upgrading and policy. The GVC model distinguishes between market, modular, relational, captive and hierarchical governance linkages within vertical ties (Gereffi *et al.*, 2005). This is rooted in transaction costs analysis and is based on determining, within such vertical ties, the level of supplier capabilities, the complexities of transactions with suppliers, and the degree to which such transactions can be easily codified. Further analyses based on such a taxonomy link it with the varied opportunities for development that they are likely to offer, some of which are more likely to promote product and process upgrading (the case of hierarchical and captive value chains), others more inclined to encourage process upgrading (within market-based chains), and others more bent to develop functional and inter-sector upgrading, as occurs in the case of modular and relational value chains (Humphrey & Schmitz, 2002). Governance pressures in GVCs are often accentuated by the need to ensure that suppliers conform with international standards on quality, labour and environmental pressures (Nadvi, 2008). Recent research within this approach shows that the governance pattern may vary significantly across different tiers of suppliers in the same value chain, as highly competent first-tier suppliers are more likely to develop relational and modular types of relationships with lead firms, whereas third and fourth-tier suppliers normally maintain hierarchical, captive or even market types of relationships with actors further up the chain (Elola *et al.*, 2012).

In contrast, the GPN approach does not offer an explicit analysis of governance relationships, although the position of lead companies vis-a-vis suppliers and subcontractors located in specific territories of the selected GPNs is often discussed. Through this means, the GPN approach clarifies the margins for upgrading processes of such sets of suppliers/providers that often tend to be located in close proximity to one another in the form of territorial clusters in the wider geography of GPNs. Going back to Yeung’s (2009) three-fold classification of production platforms, indigenous innovation and international partnership, these forms of strategic coupling in East Asian regional economies show the

different governance equilibria that are being built up between the internal/national actors (firms and regions) and the international lead firms or market leaders. Implicitly, the first situation exhibits clearer satellite relationships vis-à-vis strong market leaders (lead firms), whereas the second implies a strong endogenous capacity to control markets and technologies, and the third represents a similar situation in which the local/regional actors are quite competent/specialized, thus succeed in creating quite balanced/horizontal relationships with their international partners (market leaders).

The GIN approach makes a similar implicit assumption when it considers the specific network of innovation on a global scale and identifies the leading pole(s) of knowledge and innovation in such networks. In fact, the work done by Ernst (2009) has identified the existence of global centers of excellence, advanced locations, catching-up locations and new frontier locations. These four types of characterization define the position of firms/territorial groups of firms in the knowledge value chain (Cooke, 2005; Gielsing & Noteboom, 2006) and, in the opinion of Ernst, represent full options to participate in active forms within the knowledge economy and within high value added activities. Yet, a fuller and in-depth analysis of governance dynamics has not yet taken place within this and the former analytical approaches.

In the three frameworks however, the story is one of leading companies in skewed or even dominant relationships with a set of partner companies (in production and innovation respectively). On the issue of governance, the GVC approach holds an edge over the other two approaches in that it has clearly identified a number of different situations that offer quite diversified growth and development opportunities to dependent firms and to local systems in general.

Upgrading Processes

As highlighted in section 3.5, the upgrading margins available to firms and territories integrated in such GVCs, GPNs and GINs are to be analysed in close connection with governance relations in those chains and/or networks. As mentioned above, the GVC framework has established a clear and effective classification of the upgrading margins, including product, process, functional and inter-sector upgrading. This identification has been made with a particular objective of identifying the development opportunities of local territories beyond the benefits that individual firms may reap. Humphrey and Schmitz (2002) have considered such options and promoted applications to a wide range of international cases (Schmitz, 2004). Pietrobelli and Rabellotti (2007) have done the same in the specific context of Latin America. In this case, the combination of GVC analysis and subsector methodology has provided a further important research element. Knorringa (1999) and Artola and Parrilli (2007) have pointed to the relevance of identifying several production and market channels within the same territory. In a way, they have identified several competing value chains and, within these, specified what chains (or market channels) become most valuable from a national or territorial development perspective, i.e. which value chain/subsector has to be supported in order to deliver higher growth opportunities to national and local firms and their territories.

Regarding the other two approaches (GPN and GIN), upgrading processes are treated in rather general terms. The early work by Ernst and Kim (2002) has disclosed a number of learning mechanisms identified as a means to promote upgrading within GPNs. However, this view has not been taken up in the successive development of this theoretical approach.

More recently, Yeung's (2007, 2009) work on GPNs shows the upgrading realized in South Korea over time as a result of a very proactive innovation policy that has created new competences and learning capacities. Moreover, through the international partnership strategic coupling model, Taiwan has been able to promote deep specialization in particular production and innovation areas such as logistics, finance, and petrochemicals, among others.

In the GIN framework, upgrading processes are analysed and classified in specific innovation terms. Similar to the Humphrey and Schmitz (2002) classification, Ernst (2009) goes back to Henderson and Clark's (1990) work to pick up and define four types of innovation: incremental, radical, modular and architectural. These four modalities depend very much on the different types of innovation capabilities managed by the relevant firms (or groups of firms). Incremental innovation requires soft entrepreneurial and management capabilities (e.g. Dell's direct sales model). Radical and modular innovations are promoted by more hardcore capabilities related to the capacity to combine heterogeneous bodies of knowledge (e.g. new component technology for display devices the first, and the discovery of new drugs the second). Architectural innovation relies more on the change of the architecture/superstructure of a product while keeping its components intact (e.g. Apple's iPod). Unlike the GVC analysis, such a GIN approach is not combined with the development prospects of local territories, although a classification of firms, groups of firms or territories emerges in terms of the position they occupy in the knowledge value chain. Overall, the fast-track world of R&D is analysed and the emergence of new innovation leaders is identified (Ernst, 2009; Cooke, 2011). This is combined with the dynamic reality of related varieties that promote new growth streams within former traditional industries and technologies, i.e. the case of biotech from pharmaceuticals, ICTs and sensors from electronics and nanomaterials from chemicals (Asheim *et al.*, 2008).

Measurements and Assessment

The final and critical aspect that we want to address here is the issue of measurability and assessment. Such issues are particularly important in today's economic and policy thinking. Quantitative analyses permits the synthesis of results achieved in economic development and the assessment of the efficiency and effectiveness of public policy through measuring the impact of broad and specific programmes set up around concrete objectives. Among the three approaches, the GVC frame is more likely to be operationalized in this quantitative mode of analysis. This is one factor why this approach has also gained more currency among policy circles. Specialists within this strand of research are currently attempting to design measurements methods and applications in order to substantiate the previously qualitative analysis in more numerical forms (Sturgeon, 2009; Gereffi, 2011). Various research projects are now being carried out to disassemble the product value across different phases and agents that contribute to its creation, production and assembly, transportation and commercialization. Such work, however, does not take into account the significant variations that might be implemented across different value chains in the same industry/sector. A sort of yearly company database would be needed to have reliable information that helps researchers to control for the annual changes in each GVC led by a specific lead firm. The key question remains whether this information can be obtained on a significantly representative basis or more on the basis of specific case studies.

In contrast, the other two approaches tend to be more multi-scalar and inter-disciplinary. In this sense, measurability is more of a problem for them. While economic flows can be more readily simplified and measured, GPNs frameworks require the more demanding form of multi-level analysis that includes cultural, social, and institutional factors together with economic processes. And what about public or private actors whose objective is not necessarily economic profit and who interfere with the market process and its outcomes and outputs and, yet, cannot be easily measured in quantitative terms? Of course, measures can be specified and documented, but a standard mechanism (e.g. the HDI for human development, United Nations Development Programme) would be more appropriate in this case and, therefore, a more comparative approach is likely to result. As discussed above, the early work of Ernst and Kim can also be revived and developed further towards a more specific instrumentation and measurement.

The GIN approach has neither defined any measurement system, although it may address such an issue more easily than the GPN approach. In a way, its objective is much more focused on innovation dynamics, drivers and outputs. With this objective in mind, the whole approach can be incorporated into the Community Innovation Surveys worldwide (Oslo Manual) and the approach may become more informative and valuable. As a consequence, more effective and coherent attempts have been made to broaden the view on innovation processes by pulling together not only the classical/standard indicators of R&D expenditure, infrastructures, human capital and their outputs of scientific publications and patents, but also a more thorough set of innovation drivers (e.g. integrating, for example, learning-by-doing, by-using and by-interacting (DUI) drivers and organizational learning processes) and innovation outputs (e.g. including not only economic performance, but also different kinds of outputs such as products, processes, organizational models, marketing channels and systems, among others).

Analytical Challenges for Understanding LoRD

Once these discipline-based, content and methodological differences are identified and their strengths and weaknesses weighed, we can move to an overall reflection on the prospect of LoRD in the context of intense globalization processes. Globalization is the inescapable new context that drives opportunities as well as challenges for LoRD. Any framework that wants to analyse fully and thoroughly the prospects for LoRD needs to take into account several key issues identified by the three above-mentioned conceptual frameworks: (1) governance relations and value distribution, (2) complex production networks and strategies, and their institutional, cultural and political contextual factors and (3) innovation networks and strategies. However, before opening a more direct discussion of the relevance of such features in the context of LoRD, we describe in Figure 1 the position of each of these key actors within the globalized economic context.

In Figure 1, we identify the interrelations among the different key agents identified in this analysis of LoRD in the context of increasing globalization. In a heuristic way, we conceive the final consumers as embracing the working of all these networks of global and local actors. In this global space, GVCs help connect various actors that may include several multinational companies and local and regional production systems with other multinational companies and the final market (consumers). A range of GPNs also connects these agents for similar purposes, although in a less linear and more complex form. In this case, the scope of connections is broader and includes several agents that

Figure 1. The position of key agents and networks in the context of globalization.

may even simultaneously compete with one another on the basis of price and/or resources as well as learning and innovation capabilities. Different GINs also connect local systems and their first, second, third and fourth-tier suppliers with multinational companies that lead such networks and value chains. In particular, such networks focus on knowledge and innovation exchanges that help identify and/or determine the new geographies of production based on the capabilities built up within specific companies and LoRD systems.

Now, a key question remains open: can we rearrange or recombine these three frameworks in order to study and interpret the development of local production systems? Can we eclectically integrate these three approaches in order to develop a more holistic analysis of local development processes? Or should we create a synthetic framework that integrates the strengths of the three approaches into one specific instrument that can be applied in a more convenient and practical way? As mentioned above, these three conceptual and methodological frameworks offer a set of strategic insights for the analysis of LoRD (see Figure 2).

Pre-existing governance (and/or market power) relationships matter because they drive and limit the development processes of any locality and region. Hierarchies rather than markets or networks offer different options to local firms and need to be identified,

Figure 2. Contribution of the three frameworks to the analysis of LoRD.

analysed and put in perspective through understanding their key drivers, including not only the competences managed by the different tiers of suppliers, but also the complexity of the exchange and the codification of the knowledge involved (Humphrey & Schmitz, 2002; Gereffi *et al.*, 2005). Governance relations may change over time provided that crucial investments are made in specific spheres, such as R&D as a means to avoid diminishing returns of network integration (see Ernst, 2009). And as Elola *et al.* (2012), governance relationships cannot be homogenized within an industry or a value chain. They really depend on the strategic position and the competences managed by the different tiers of suppliers. This situation determines the distribution and/or appropriation of value that specific localities and regions obtain from their participation in the GVC and, as a consequence, the margins for upgrading and growth available within these territories. For this reason, recent GVC analyses emphasize the importance of disaggregating the value chain into different phases and components that involve part of the overall value of the final product taken to the market (Sturgeon *et al.*, 2008). This is one of the key messages that the GVC framework delivers for LoRD.

Furthermore, the critical lesson derived from the application of the GPN conceptual framework is the relevance of transnational production networks that establish and/or develop different types of strategic coupling, some of which may be more focused on creating endogenous knowledge and innovation capabilities, whereas others may be concerned with setting up crucial international partnerships with multinational companies and, in other cases, some might want to sacrifice any leadership or autonomy desires in view of obtaining some kind of fast-track LoRD. This approach goes beyond firm-level analysis to take into account complex global industrial and national dynamics in which commercial transactions occur within complex institutional exchanges, cultural norms and political contexts (e.g. labour conditions, forms of managerial control). These are additional conditions and levers that influence the in-progress development outcome (Coe *et al.*, 2004, 2008), which seems to move away from Eurocentrism and to be open to any “unknown” development outcome, e.g. the growth of new hegemonies such as

China and the BRIMCs (Henderson & Nadvi, 2011). As Yang discusses in this special issue, strategic uncoupling or decoupling need to be integrated within this kind of analysis as a means to take into account the changes that happen every day that may depend either on exogenous (e.g. changing market demand or geopolitical equilibriums) or endogenous factors (e.g. new innovation strategies and policies by firms and governments). Wider and changing geographies are a fundamental aspect of any complete LoRD analysis that can offer appropriate instruments for interpretation and prospection of effective development strategies.

The GIN framework delivers a third strategic asset in the analysis of LoRD: innovation networks and strategies. This is distinct from “innovation systems” as it takes into account the fast modifications that occur worldwide in the leading business activity, R&D&I, which affects any country, region and locality, and in which any of these territories can upgrade through appropriate dynamics and strategies in order to catch up with, and consolidate, a more competitive position in global markets. Overall, the GIN framework is more explicit and dynamic than the GPN structure in the analysis of private sector objectives, plans and strategies of lead firms and less well-known specialized suppliers. In this endeavor, the GIN maps out the relationships that are being built up to develop higher-level capabilities used to discover new technologies, formats and products that open the way for new industry segments in which significant market shares can be developed (e.g. the smartphone and tablet segment of the ICT industry instead of the saturated and monopolized HDD segment).

In short, this section does not intend to synthesize the immensely rich work done by a large number of scholars adopting different but valuable conceptual frameworks for the analysis of globalization dynamics; neither does it plan to determine which framework is better. As these frameworks have been developed with different purposes in mind, we believe they are justified within their specific objectives and analytical tasks. They also have further potential for exploration and scientific advances in aspects that might be more methodological or content-based. The main objective of this paper, and more broadly this special issue, is to present the relevance of these frameworks for the analysis and promotion of LoRD. With this objective in mind, we have identified specific features of these approaches that are particularly relevant for LoRD and have brought them together in a synthetic diagram that stresses this potentially useful combination. New successive steps might include the implementation of specific studies that take into account these key features and identify valid proxies for qualitative and quantitative analysis through measuring more clearly the opportunities and constraints of LoRD. In the next and final section, we provide a brief description of the different papers included in this special issue and their strategic contributions to key issues of firm, network and system exchanges, growth and development within these three analytical frameworks and their associated streams of academic literature.

Variety of Contributions in This Issue

This special issue helps analyse the selected topic of LoRD through a variety of high-quality contributions developed by some of the leading experts in the field. These articles represent specific applications that demonstrate the advantages of specific theoretical frameworks (GVC, GPN and GIN). In a more implicit way, their limitations may become evident in light of this introductory paper focusing on the comparison and discussion of

their opportunities, complementarities and limitations vis-à-vis the discussion of their contributions to the interpretation of regional development processes.

A first group of contributions focuses on the application of the GVC perspective to a set of relevant empirical cases. Of course, these contributions refer to the case of specific value chains and to a limited number of companies, which is what the GVC framework usually delivers, thus leaving eventual extensions and generalization to further complementary analyses with this and other globalization approaches (see Figure 2).

In particular, Elola, Parrilli and Rabellotti (EPR) apply the GVC framework to the analysis of the impact of the internationalization of large lead firms to other countries in a process that jeopardizes the sustainability and resilience of the local production system in the home country. A trade-off is visible in local development terms, since only a few first tier suppliers are capable enough to follow the large lead companies in their internationalization strategies, thus keeping their competitive position within the GVC and the global market. Many other small and medium-sized companies in the home region suffer from the relocation of production activities to emerging countries. The innovation strategies adopted by the lead companies present the same trade-off as few local innovation organizations are involved in cutting-edge innovation projects, whereas lead companies tend to establish stronger partnerships with other multinational companies. On the whole, the EPR article enriches the literature by showing the various types of (governance) relationships established between lead firms and their different tiers of suppliers, and the effects that the internationalization strategies of the former have on the latter and on their localized production systems. In this way, the GVC framework opens the way to new, more dynamic analyses of the impact of globalization on such local systems of production and innovation.

A second contribution based on the GVC approach is developed by Elola, López and Valdaliso (ELV) to examine the aircraft industry in the Basque Country. The key objective of this article is to analyse how local industries develop a new specialization, that is, how a cluster emerges, and how it evolves over time. For that purpose, ELV explicitly consider the role of institutional and technological changes, and how they affect the industrial structure and the governance patterns of GVCs. They observe that global-scale regulations (deregulation and competition policy) and technological change, together with local factors such as the existence of anchor firms, local policies, related variety and social capital at regional and local levels can play a significant role in the emergence of the cluster and its insertion in competitive GVCs. Beyond these mostly exogenous levers, the ELV analysis shows, in particular, that the development of suppliers' capabilities also has a relevant role in the evolution of the governance patterns of GVCs.

The paper by Kadarusman and Nadvi (KN) uses the GVC approach to study upgrading in the electronics and garments industries in Indonesia. The paper argues that while the GVC framework has focused on identifying distinct forms of upgrading, it remains relatively weak in considering how upgrading is actually brought about at the firm level. Within the lineal construct of the GVC framework, patterns of upgrading are determined by the nature of governance ties that local supplies have with their lead firms. This gives little space for agency by local firms to develop capabilities and learn. In common with other recent commentators (see, in particular, Morrison *et al.*, 2008; Pietrobelli & Rabellotti, 2011) the paper suggests that conceptually, the GVC approach could benefit from drawing upon insights emanating from the technological capabilities and innovation systems literature. The paper also shows the some aspects of upgrading (including

product and functional upgrading) by local garment and electronics firms were only feasible where local producers were not inserted into GVC ties with global lead firms but were instead operating more directly either in domestic or regional markets. These findings, similar to those seen by Navas-Aleman (2011) in the Brazilian furniture and footwear industries, emphasize the importance of local forms of learning.

After these important contributions focusing on the GVC approach and identifying the economic, business and governance linkages among firms in international markets, we move on with some papers that stress the strategic value of the GPN analytical framework, which has the critical capacity of clarifying the transformations that occur in broad, cross-regional geographic areas. Chun Yang's (CY) contribution is framed within the GPN approach to analyse globalization and its connection to the evolutionary economic geography literature. The novelty of this work resides in the endeavour of dynamizing the rather static geographical application of the GPN framework, usually oriented towards stabilizing markets and governance relationships, in order to account for the modifications that have gradually taken place within GPNs in the East Asian region. In fact, CY identifies the transformation of the specific "strategic coupling" of suppliers, industries and territories organized by lead multinationals based in Hong Kong and Taiwan and their new uncoupling and re-coupling (production) strategies from their traditional locations to nearby cheaper economic locations in inland China. This is explained in relation to the policy transformation of cross-border GPNs focusing on export markets to new markets that the central government in China has recently targeted as a means to promote a new, more inclusive kind of development led by internal demand.

From a more eclectic perspective, Hervás and Boix (HB) pull together these two approaches, GVCs and GPNs, in the context of the ceramic tile and the glazing industry cluster in Castellon, Spain. Their key idea is to capitalize on the two different strengths of these frameworks, the first being more focused on understanding the knowledge flows between multinational companies (or the so-called "technological gatekeepers" in more horizontal types of clusters) and the local firms, and how these flows orient the global positioning of local firms and their clusters. The strength of the GPN framework is to identify the ways through which local firms in these clusters are affected by globalization processes. This is particularly true when such an approach is combined with an evolutionary geography perspective that incorporates the transformations in global markets and production networks. The HB contribution specifies the importance of global knowledge flows for local development processes with a combined approach that brings together (1) the interest in understanding the rather linear but also direct relations that connect large lead companies with local small and medium-sized enterprises and, (2) the interest in showing the dynamic modifications occurring in global markets that also affect the development of cluster prospects.

The third stream of relevant literature refers to the novel GIN approach. The relevance of this approach is that it has evolved from its earlier focus on innovation processes and systems (e.g. regional and national innovation systems) to take into account the emerging dominance of global knowledge flows across countries, lead companies and smaller suppliers. At the same time, it recognizes that relevant knowledge flows and market and production dynamics are no longer so much controlled by systems, but are rather developed across networks beyond the exclusive control of some lead companies. Modifications of market power occur depending on the knowledge pools and flows managed by firms and their production systems that can be promoted (or restrained) by

countries/governments. Within this approach, this special issue presents the seminal contribution by a pioneer of this concept, Philip Cooke (PC).

One of the critical contributions in this issue is PC's paper on the relevance of GINs applied to the hard disk drives (HDDs) and the smartphone ICT industries in South-East Asia and the new trend towards the marginalization of Singapore in the latter industry vis-à-vis the competitive position of other East Asian countries. In his view, the GIN approach "concerns complex socio-economic and political governance processes focused upon innovation (which is) argued by many to be the guiding principle of the construction of economic advantage in the contemporary era" (Cooke, 2012). In particular, PC realizes that the former GPN approach might be static and might not have enough explanatory power regarding the innovation and transformation dynamics that occur in global markets, since it focuses on mapping production geographies at a specific moment in time, thus stabilizing the global environment in which growth usually takes place through acquisitions. In contrast, PC claims the strength of the GIN framework in particular cases, such as the ICT industry (particularly the HDD industry), where innovations and changes are taking place on a daily basis as a substantial feature of this industry. The most interesting novelty of such an approach is that instead of showing the dominance of multinational corporations in the development and control of GPNs, he shows the way market power and knowledge shift depending on specific country or network strategies. In the case of the HDD industry, the new smartphones and tablets products did not require any HDD and this structural modification has led, for example, Singapore, to a dead-end track and the transfer of dominance in these new ICT industries and products from Singapore to Taiwan and South Korea.

In conclusion, we need to develop a more synthetic analytical framework in order to explain the dynamic transformation of industrial clusters in LoRD that simultaneously enjoy agglomeration economies derived from spatial concentration and proximity of producers in these clusters and benefits from their strategic importance in globally decentralized production networks comprising different clusters. In other words, we can think of GVCs and production-innovation networks as organizational clusters that produce footprints in different locations. In each of these locations, there are territorially based clusters constituted through overlapping footprints of similar chains and networks. We might therefore call this a global approach to industrial clusters, for the reason that there are "both" local and non-local links in each of these clusters. Those local links are related to such agglomeration economies as the existence of a local pool of cheap or specialized labour, the provision of non-traded inputs through infrastructure, subsidies or grants, and access to local markets. However, these local links are insufficient in explaining the formation and evolutionary growth of such clusters. We need to understand their position in GVCs, GPN and GIN that are mediated through non-local links such as firm-specific organization of value-chain activity. In such a global model, industrial clusters emerge to fulfil specific and yet complementary functions in particular value chains. Such functional links are external to individual clusters and often ignored in the existing literature on industrial clusters. They can contribute to greater technological capability and production know-how among local firms. In the context of highly dynamic global economy, they are perhaps one of the more reliable and sustainable routes to regional development. Whatever the chosen development trajectory and policy regime in localities and regions, one important lesson is that they are unlikely to be effective and sustainable without a fuller appreciation of the trans-local dynamics in which the region and its

clusters are located. This is the key contribution of thinking of industrial clusters as necessarily situated in the competitive dynamics of GVCs and global production and/or innovation networks.

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Note

1. However, political scientist might use the GPN framework with the objective of studying the global flows of capital and capital accumulation processes around the world, whereas development scientists might use it to identify the development potential of specific countries or regions.

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