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## Global Innovation Networks – Organizations and People

Marcelo Cano-Kollmann<sup>a</sup>, T.J. Hannigan<sup>b</sup>, Ram Mudambi<sup>c,\*</sup><sup>a</sup> Department of Management, College of Business, Ohio University, Athens, OH, USA<sup>b</sup> Enterprise Insights Team Lead, Dropbox Inc., San Francisco, USA<sup>c</sup> Department of Strategic Management, Fox School of Business, Temple University, Philadelphia, PA 19122, USA

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## ABSTRACT

Innovation is increasingly the outcome of global networks that connect geographically dispersed knowledge centers. The international business (IB) literature has developed a sophisticated understanding of the multinational enterprise (MNE) as an organization generates value by integrating knowledge across national borders. We advance this literature by making three key arguments. First we highlight the three megatrends that shape the strategy of the modern MNE: the disaggregation of the value chain into ever narrower activities, the migration of value to knowledge-intensive intangibles and the rise of huge emerging markets like China and India, whose domestic firms can grow to enormous size before venturing abroad. Second, we trace these three megatrends to falling spatial transaction costs, enabled in the main, by digitalization. Third, we draw on earlier research on the generic forms of global linkages, arguing that the IB literature has limited itself to organizational pipelines, while paying relatively little attention to personal relationships. The latter are particularly important in the genesis of both entrepreneurship and radical innovation, but are particularly sensitive to the anti-globalization policies. An environment where technology continues to reduce spatial transaction costs, while policy raises them, strengthens large MNEs at the expense of innovative international new ventures.

## 1. Introduction

The distribution of economic value creating activities across space has intrigued scholars since at least the nineteenth century. The modern study of this phenomenon has its roots in the classic work of Marshall (1920). Over the course of the last century, it has been studied from different perspectives, leading to the formation of several research communities and each with an associated body of literature. Economic geographers and regional scientists mainly study the characteristics of *places* while international business scholars focus on the *organization* of economic activities. In other words, economic geographers' and regional scientists' main focus of interest is the location, while for international business scholars, it is the (multinational) firm. Over the last few decades, innovation has received increasing amounts of attention from both research communities who recognize it as one of the key drivers of the modern knowledge economy.

The study of global innovation networks has been undertaken within three major literatures: international business, economic geography and innovation management. In the main, these literatures have moved along in parallel with one another, but their actual analytical connections remained very limited, so that the analysis of global innovation networks remains partial and fragmented. The main goal of this special issue is to work at the nexus of these three research communities and literatures and build knowledge conduits among them. This research aims to encourage cross- and inter-disciplinary dialog with the view of building a holistic view of

\* Corresponding author.

E-mail addresses: [canokoll@ohio.edu](mailto:canokoll@ohio.edu) (M. Cano-Kollmann), [tj.hannigan@mac.com](mailto:tj.hannigan@mac.com) (T.J. Hannigan), [ram.mudambi@temple.edu](mailto:ram.mudambi@temple.edu) (R. Mudambi).<http://dx.doi.org/10.1016/j.intman.2017.09.008>

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the spatial organization of global innovation.

We begin by characterizing the three major trends that are changing the face of economic activity. Thereafter, we relate these trends to the two generic forms of connectivity that enable the very functioning of global innovation networks. These two forms are based on organizations (mainly MNEs) on the one hand and people (internationally mobile entrepreneurs) on the other. We use our analysis to highlight both causes and effects of the current disenchantment with globalization, especially in advanced economies – disenchantment that has resulted in the several important policy changes aimed at stemming the steady advance of globalization that began at the end of World War II. We argue that while policy changes may move to limit global connectivity, technology will continue to enable it. This suggests that negative effects of policy are likely to be asymmetric and strengthen larger MNEs at the expense of entrepreneurs and small firms. This analysis enables us to identify key avenues for future innovation research. Finally, we summarize the papers in this special issue and relate them to our overarching theme of connectivity.

## 2. Three megatrends

There are three megatrends that underlie much of the change that we have witnessed over the last few decades and that will continue to shape the world economy. The first megatrend is the shift from trade-in-goods to trade-in-activities. Beginning several decades ago, but accelerating rapidly over the last decade, products and services are increasingly emerging from global value chains (GVCs) that are geographically dispersed around the globe. These GVCs are orchestrated, in the main, by multinational enterprises (MNEs) and increasingly disaggregated and fine-sliced into narrow, highly specific activities that are undertaken in economic clusters. These narrow activities produce intermediates (and not complete goods or services) and these compose the vast majority of all international trade today.

The second megatrend is the rise of knowledge-intensive intangibles. Value is rapidly migrating out of tangible goods and services that are becoming commoditized and into the soft intangibles that encase them. These intangibles arise from specialized, upstream knowledge (R & D, patents, inimitable organizational routines, software, training) and downstream knowledge (brands, trademarks, customer service) activities. This migration of value has dramatically magnified the importance of innovation, concomitantly shortening technology lifecycles.

The third megatrend is the rise of emerging markets. The number of locations where the highly specific GVC activities can be performed has ballooned over the last two decades. A long list of cluster locations in Asia and South America and even some parts of Africa have become integral parts of GVCs. These locations are tightly woven into global economy and give rise to perceptions of “flatness” perceived by many lay observers.

### 2.1. Knowledge-intensity, offshoring, and modularization

The traditional international business view of the global economy is rooted in two centuries of international trade theory (Mudambi, 1998). In this view, goods and services are produced in geographical locations and international trade occurs when these are exchanged across national borders. However, this textbook view has been slowly diverging away from the reality of international trade for almost half a century. Over the last twenty years, the rise of GVCs has heralded the disaggregation of goods and services and the geographic dispersal of the underlying activities. Thus, what is now undertaken in a location is not a good or service, but an activity.

The fine-slicing of individual activities in GVCs occurs in a very specific manner. Aided by advancing technology, managers continually separate activities into specialized (non-repetitive) components and standardized (repetitive) ones. Specialized activities tend to be associated with knowledge-intensive intangibles, whereas standardized activities tend to be characterized by relatively low knowledge-intensity and based on tangibles. As noted above, knowledge-intensive intangibles appear in two broad forms: those based on upstream R & D knowledge and those based on downstream marketing knowledge.

The reason managers continually fine-slice the value chain is to lower the cost of producing the standardized, low-knowledge components. One way to do this is through offshoring to low-cost emerging market economies (Andersson et al., 2016). However, in order to geographically disperse the activities that underlie a good or a service, it is necessary to make them separable. The main process through which this occurs is modularization, whereby the final value proposition is constituted as a set of plug-and-play modules. (McDermott et al., 2013).

While the extent of modularity is affected by engineering and physical realities, managers have significant flexibility in designing the strategic architecture of the good or service they deliver to their customers. In other words, the observed extent of modularity is the outcome of both engineering and strategy. Modularization also facilitates the black-boxing of technologies so that the knowledge and capabilities related to one module can be disconnected from those in another. Thus, the orchestrating firm can maintain control of the system architecture while outsourcing even modules with high knowledge-intensity (Kotha and Srikanth, 2013).

### 2.2. Digitalization, automation and emerging markets

A second route to reducing the cost of repetitive low-knowledge activities is through technology-propelled automation. Advances in extant technologies like robotics and artificial intelligence as well as in rapidly emerging technologies like 3D printing are changing the face of the modern production systems. While the precise effects of automation differ across the sectors, we can discern two common characteristics. The key enabler of the dramatic advances in automation is digitalization and the most important economic and social outcome is the drastic decline in employee headcount per unit of output (Autor et al., 2003). Thus, while output

levels continue to rise, sometimes exponentially, employment numbers are flat or declining in most advanced economies. This trend is beginning to be seen in emerging economies as well.

The activities undertaken in emerging market economies are both substitutive and complementary of activities undertaken in advanced market economies. At the simplest level, the automation of factories in advanced economies acts as a substitute for the offshoring of low skill jobs to emerging economies. However, the number of emerging economies continues to grow and some of the leading ones like South Korea and Singapore have even achieved advanced-economy status. Others like China and India are home to knowledge clusters that are tightly integrated into global knowledge networks. Leading emerging economies like China and India undertake lower skill activities that are substitutive with automation in advanced market economies. However, the data indicates that virtually every major firm runs R&D centers in China and India (Branstetter et al., 2015). These R&D activities are, in the main, complementary to activities in advanced economies.

Hence the overall effect of rapidly advancing technology and improved automation on emerging economies is complex. Technology, and especially digitalization, is difficult to impede with policy. Hence, regardless of policies enacted at the national level, it is likely that global innovation networks binding together locations in advanced economies with those in emerging economies will continue to grow stronger. With this increased integration, digitalization-driven automation in advanced economies will strengthen the complementary high-knowledge activities in emerging economies and weaken the substitutive low-knowledge ones. On the one hand, this process harnesses the talents of hundreds of thousands of creative individuals and brings them into the global economy. On the other hand, it is also likely to exacerbate tensions between the high-knowledge and low-knowledge segments of emerging economies, mirroring the current situation in advanced economies.

### 2.3. Product life cycles, industry boundaries and increasing returns to scale

Increasing technology intensity and activity specialization reduces the duration of product life cycles as narrower activities are distributed over more organizations and development teams. Increased innovation focus among a larger base of supplier firms allows orchestrating firms to become what have been called high leverage innovators that harness many times their own R&D spending through the innovation efforts of their suppliers (Tubbs, 2008; Satariano, 2015).

As product life cycles grow shorter, the availability of a wider array of specialized products creates the opportunities for ever newer orchestrators to recombine the modular products of specialized activities to disrupt extant mature industries. This renders traditional industry boundaries porous both in terms of products and services as well as geography. Examples of the former include software firms entering the automobile business and supermarkets and retailers offering banking services. Examples of the latter include Chinese and Indian emerging market MNEs beginning to compete in global markets with leading firms based in advanced market economies.

The sheer scalability of many of these new technologies generates increasing returns to scale on an order of magnitude never seen before. This is the basis of the so-called “winner-take-all” economy that witnesses rising inequality not only between individuals, but between leading and lagging firms. This creates a whole new basis for insidership on a global scale that stems from winning status. In other words, leading (often foreign) firms become automatic insiders in knowledge clusters, while lagging (often local) firms remain outsiders (Cantwell and Mudambi, 2011). Indeed, there is some evidence that the rising income inequality in advanced economies has its roots in firm-level rather than professional level employment, i.e., employees in the same profession in leading firms make significantly higher incomes than those in lagging firms (Orszag, 2015).

### 3. Generic forms of connectivity: pipelines vs. personal relationships

There is a significant body of work focused on global innovation networks within the international business literature (Birkinshaw and Hood, 1998; Frost, 2001; Cantwell and Mudambi, 2005). However, almost without exception, the extant research is operationalized at the organizational level. It would be fair to say that the majority of this work is part and parcel of the international business research on headquarter-subsidiary relationships and addresses such issues as dual embeddedness and multiple embeddedness (e.g., Andersson et al., 2002; Meyer et al., 2011).

Organizationally-motivated linkages or pipelines are a critical component of global innovation networks and probably still encompass the majority of cross-border knowledge connectivity (Bathelt et al., 2004; Perri et al., 2017). However, their preeminence may well stem from the historically high spatial transaction costs of business operation even within a country (Beugelsdijk and Mudambi, 2013). The widely documented rapid declines in spatial transaction costs over the last two decades (Cuervo-Cazurra et al., 2017), may have a stronger effect on (resource-poor) personal relationships than on (resource-rich) organizational pipelines. Indeed, some have gone so far as to call the twenty-first century the “entrepreneurial economy” as opposed to the “managerial economy” of the twentieth century (Audretsch and Thurik, 2001).

Hence the near exclusive focus on organizationally-motivated linkages neglects an important and growing component of global innovation networks. These linkages, that are motivated by individuals, have been called “personal relationships” (Lorenzen and Mudambi, 2013). The networks spawned by these linkages have contrasting properties with those spawned by organizations.

Organizations make most decisions, and in particular, decisions about location, based on strategy. As noted in a large body of international business research, following from the seminal insights of Dunning (1977, 1980), MNEs make location decisions based on downstream market-seeking or upstream asset-seeking strategies. In contrast, individuals make location decisions based on a wide range of often serendipitous motives. These include education, marriage, location of kin and so on (Kim et al., 2016).

This suggests that organizationally motivated pipelines are likely to be built to access or develop knowledge related to the MNE's

extant knowledge base. This is likely to lead to incremental innovation. In contrast, personal relationships are much more unpredictable. Since the original motivation may not be knowledge relatedness, it is more likely that they will result in radical or architectural innovation (Henderson and Clark, 1990).

Personal relationships are more likely to develop in today's world of large global diasporas. Scholars like Saxenian (2006) have probed the role of the Chinese and Taiwanese diaspora in generating fecund relationships linking Silicon Valley to valuable human resources in Asia. More recently there has been work examining the role of the Indian diaspora in seeding global entrepreneurial networks linked to the U.S. and the U.K. (Lorenzen and Mudambi, 2013). This body of work suggests that international new ventures (Oviatt and McDougall, 1994) have become the “typical” form of high tech entrepreneurship. Global Argonauts have become the norm, rather than the exception (Kim et al., 2016).

#### 4. Globalization – rising skepticism

The rise of global networks through both the modalities of organizational pipelines and personal relationships has fueled an enormous increase in worldwide wealth creation. However, while this increased level of global connectedness has benefited the vast majority of the world's population, there have also been some losers. These losers have been concentrated among the least-educated and lowest-skilled populations in advanced economies. It is useful to consider a pedagogical example to illustrate this global shift.

For much of the twentieth century, per capita income was strongly correlated with geography. The income and wellbeing of most people depended, first and foremost, on where they were born. A person with very low human capital born in a wealthy country was almost always better off than a person with a great of human capital, but born in a poor one. This outcome arose because of high spatial transaction costs. Organizations in wealthy countries were unable to move low skill activities out of their high cost locations. In a very real sense, low-skill workers in rich countries, aided by their labor unions, were free-riding on the value creation of their high-skill fellow countrymen.

As spatial transaction costs began to fall, low-knowledge activities began to move to lower cost locations. As these costs nosedived over the last two decades, the mobility of activities rose to a crescendo. In today's world, an individual's income and standard of living is much more closely aligned with his or her human capital than in the mid-twentieth century.

Thus, the megatrends directly threaten low-skill individuals in wealthy economies, whose living standards have fallen in both real and nominal terms (Johnson, 1997; Autor et al., 2003). Falling spatial transaction costs have also created a new “global elite” (global Argonauts, MNE executives, globally connected innovators and knowledge-creators) whose value-creating capability hinges on connectivity. However, the low-skill population is very large and constitutes the majority in almost all countries. Resentment against their falling living standards and against the highly visible new global elite has fueled populist movements that have succeeded in implementing anti-globalization policies in many countries.

While policy may be reversed, technology is much more difficult to stop (Cuervo-Cazurra et al., 2017). A key implication of this point is that policy reversals are likely to have stronger effects on personal relationships than on organizational pipelines. Large MNEs have the deep pockets necessary to implement technological workarounds to circumvent anti-globalization policies as well as to lobby successfully against policies that harm their specific interests.

However, the policy backlash may slow or even prevent the international mobility of people, an outcome that will be particularly deleterious to small international new ventures that are the creative vehicles of global Argonauts. Hence, anti-globalization policies may well tip the balance against small, upstart competitors and in favor of large MNEs. This outcome will harm the global output of radial and architectural innovation, a cost that will be borne by all of humanity. It will be particularly detrimental to economies like the U.S. that depend heavily on immigrants for the health and dynamism of their entrepreneurial and innovation eco-systems.

#### 5. Common avenues, distinct angles: articles in this special issue

Our Call for Papers entitled “Global Innovation Networks – Organizations and People” was issued in November of 2015. We received a total of 20 manuscripts, from which we selected 7 after 3 rounds of reviews. On the description in the call for papers we advocated for a research agenda at the intersection of international business, economic geography and innovation (Cano-Kollmann et al., 2016). As discussed on Section 2, we identified three salient megatrends within this agenda. First, the shift from trade-in-goods to trade-in-activities, or in other words, the geographical disaggregation of value chains (GVCs). Second, the growing importance of intangible resources (specifically knowledge) over tangible ones, as a source of competitive advantage. Third, the rise of emerging markets. The papers included in this special issue cover these topics from different angles and at various levels of analysis, providing novel insights and opening avenues for follow-up research.

Regarding the first megatrend, three papers in particular focus especially on GVCs, all from different points of view. Ibarra-Caton and Mataloni (2017-in this issue) analyze the transfer of intangibles (which is our second megatrend) in the form of assistance from headquarters to subsidiaries, within global GVCs. They find that a subsidiary's role in a global value chain will directly affect the volume of knowledge assistance it receives from headquarters. Subsidiaries engaged in production sharing with their parents receive more knowledge services than those which are not. Furthermore, the nature of that assistance depends on the technological complexity of the subsidiary's activities. Technologically-capable subsidiaries receive more services than subsidiaries in low-tech manufacturing industries.

Burger et al. (2017-in this issue) also focus on GVCs, but in this case examining the value captured by firms linked to those GVCs. They investigate empirically the relationship between functional upgrading (i.e. moving from low-end activities to more sophisticated ones along the value chain) in MNE subsidiaries and the amount of value they capture. As predicted by the ‘smile of value

creation' (Mudambi, 2008), their findings confirm that upgrading to activities that require more sophisticated competencies allows them to capture more value. Functional upgrading in subsidiaries can be understood as part of the process of subsidiary competence-creation (Cantwell and Mudambi, 2005).

Finally, Murphree and Anderson (2017-in this issue) study the underexplored aspect of power balance and strategic dynamics between GVC orchestrators and contract manufacturers. Increasingly, MNEs prefer to act as orchestrators of activities rather than to vertically integrate entire GVCs (Mudambi, 2008). Of these GVC activities, they tend to conduct only the high-value added ones in-house (e.g. R & D and design, among the upstream activities, and marketing and sales among the downstream ones). The easy-to-imitate, low-value added activities, such as manufacturing of commodity components, are usually outsourced to external contractors. From a resource standpoint, activities that require an intensive use of tangible resources are the first to be contracted-out, while those that revolve around intangibles are the ones kept inside. According to resource-dependence theory (RDT), control over a critical resource is a source of power (Ulrich and Barney, 1984). In this case, production orders are the resource on which all contract manufacturers depend. The strategy of these contract manufacturers to deal with the demands and pressures from buyers, however, differs widely. Interestingly, size seems to be a negative factor for contract manufacturers dealing with demanding buyers. When contract manufacturers are large and rely on a narrow range repeat big buyers, they are likely to acquiesce to their demands due to the enormous potential downside of losing a large buyer. Smaller contract manufacturing firms, on the other hand, have low overhead and can cover operating costs with small orders from multiple clients. This gives them a degree of flexibility that larger firms don't have. Additionally, SME contract manufacturers generally do not take on large debt burdens. As a result, they have the ability to avoid the lead buyers' demands regarding subcontracting, and drop the worst buyers without a serious risk to firm survival.

The second megatrend, the rising value of knowledge-intangibles, is present in some shape or form in most of the papers. In particular, Un and Rodríguez (2017-in this issue) compare the effect of R & D collaboration for MNE subsidiaries vis-à-vis domestic firms. They argue that the outcome of these collaborations is shaped by distinct incentives to establish relationships with different sets of partners. Subsidiaries already benefit from access to their parents' global pools of knowledge, so their primary driver in establishing collaborations for product innovation is the need to be responsive to local markets. Therefore, they benefit the most when they tap into the knowledge of local customers. Domestic firms, on the other hand, are already embedded in the local milieu, but lack global connections. Thus, their product innovation benefits from engaging in collaboration partnerships with global suppliers and universities.

The piece by Goerzen (2017-in this issue) explores an overlooked organizational form (intercluster alliances) that facilitates the creation of boundary-spanning linkages for small firms located in clusters, which (as is usually the case with SMEs) operate and internationalize on a shoestring budget. These intercluster alliances are institutional vehicles that can provide connectivity benefits to SMEs which lack the orchestrating capabilities of large MNEs. Those linkages facilitated by intercluster alliances are the conduits through which knowledge intangibles can be transferred to and from those small cluster firms.

The third megatrend, the rise of emerging markets, is the backdrop for three of the papers. At the macro level, Guimón et al. (2017-in this issue) describe the efforts by the government of a relatively small emerging economy (Chile) to institute policies and mechanisms to attract R & D-related foreign investments. While publicly-funded incentives are known to play a role in shaping the way firms innovate in developed economies (Cano-Kollmann et al., 2017) those incentives are not necessarily effective in attracting innovative activities to countries whose national systems of innovation are at a nascent stage.

At the micro level, Ajith et al. (2017-in this issue) analyze the catch-up process of emerging market firms in highly competitive new industries, using the Indian solar power industry as a setting. The main argument is that these firms depend for their survival on their ability to catch up quickly, both in output and innovation capabilities, because they're exposed to global competition from the start. This is in stark contrast with more mature industries where emerging market firms may be able to cooperate, especially when they are linked to the GVCs of foreign companies, upgrading their capabilities throughout the process.

Finally, the piece by Murphree and Anderson (2017-in this issue), already discussed, uses the Chinese plastics industry as the setting to study power strategies and information asymmetries between foreign orchestrators and domestic contractors.

## 6. Concluding remarks

The papers included in this special issue tackle the research agenda we have outlined from different angles. The rise of emerging markets and their increasing importance in the global economy is, to a large extent, underpinned by their integration to global value chains. Lower barriers to the movement of goods and people, as well as falling transportation and transaction costs, all play a significant role in fostering such integration. The main driver, however, is the connectivity supported by overlapping networks of organization-based pipelines and personal relationships that crisscross the world. These linkages are the conduits through which huge volumes of information, ideas, and knowledge, circulate around the world.

The existence of these networks, and the ever-decreasing cost of using them to transfer both codified and tacit knowledge across geographic space, create immense potential benefits for both developed and emerging economies. Firms in developed economies can maximize their ability to create value, by focusing on core activities driven by intangible assets, which is where their competitive advantage lies, while orchestrating lower-value activities through internationally dispersed GVCs. Firms from emerging economies, on the other hand, also benefit from integrating into global GVCs, which is usually the first step in the catch-up process. This integration allows them to learn and gradually upgrade to higher value-added activities, eventually turning some of their firms into world-class players.

These processes, however, produce both winners and losers. Unskilled workers in developed economies may not only become unemployed but "unemployable", as their jobs are either offshored or cease to exist altogether. At the same time, firms in emerging

economies that are unwilling or unable to integrate to the global economy or to deal with increased competition in their formerly protected home markets, are simply wiped out. Lower barriers between countries, while facilitating economic integration, also open the door to other processes such as uncontrolled migrations, which can increase competition for low-skill jobs as well as exacerbate social tensions in developed economies.

The apparent contradictions of globalization create tensions between those who experience its undeniable benefits and those who suffer its downsides. These growing ideological rifts are the backdrop for populist reactions and policy changes in many countries. While these reactions are unlikely to reverse or even put a stop to the growing integration of the world in the aggregate, they may certainly have significant effects for the sectors, countries or regions affected.

Unfortunately, reactive policies may often be motivated by emotion rather than driven by a full understanding of the complex realities of the globalized economy. The most obvious of these reactive policies against globalization is to raise new blanket barriers to the movement of both people and goods. While analyzing the effect of potential new barriers and the backlash against globalization is beyond the scope of this piece or even this special issue, it is important to understand the processes that have been driving economic integration on a global scale and how these processes will be affected. The papers on this special issue provide insights into the fine-grained mechanisms underpinning the integration of emerging markets into GVCs and the critical importance of intangible resources in this process. International business scholars have a contribution to make to the conversations taking place in the arena of political economy. In order to make such contribution, however, they must fully understand the complex interactions between organizations and people across borders and geographic distances. We hope that this special issue, which was proposed by IB scholars who advocate the incorporation of interdisciplinary perspectives to this line of research, sheds some light and increases our understanding of these complex phenomena.

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