Local Capacity, Innovative Entrepreneurial Places and Global Connections: An Overview

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It has become a truism to argue that the patterns and rates of long-term economic growth are strongly driven by technlogical advancement and innovation. Accumulation and upgrading of technological capabilities and market innovation activities lead to growth by deepening and diversifying industrial activities, propelling and fundamentally enhancing growth potential in both developed and emerging countries (Abramovitz, 1986; Lall 1992; Fagerberg, 1995; Kim and Nelson, 2000; Fagerberg et al., 2007).

The relationship between technological upgrading and economic growth has been explored through various theoretical frameworks including evolutionary economics, innovation studies, and the resource-based view or capability theory (Nelson and Winter, 1982; Lall, 1992, Cimoli et al., 2009). The range of empirical innovation studies have improved our understanding of patterns of technology upgrading across firms, sectors, regions, and countries. In particular, systematic firm-level studies undertaken since at least the 1980s have demonstrated country and sector-specific paths of technology upgrading. These have been accompanied by sector studies since the 1990s which have enriched our understanding of a variety of sector-specific technology paths (Malerba 2004). Extensive research has explored the capabilities at different development stages and identified the characteristics of each stage. For example, Kim (1997) divides technology upgrading in developing countries into the stages of adoption, assimilation, and imitative and creative innovation. In major contributions to the literature, Lee (2013, 2019) has focused on diverse policy strategies, such as stage-skipping or path-creating, and diverse

windows of opportunity that lend themselves to closing the development gaps and leapfrogging by latecomers. The literature has also explored different roles of diverse modes of international technology transfer such as foreign direct investment, trade, technology licensing, import of capital goods, and hiring and exchange of personnel, and the necessary absorptive capacity required for successful technology upgrading (Amsden, 2001; Radosevic, 1999).

The past several decades have seen two major events impacting global industrial structure. During the 1970-1990 period the concept of the global value chains (GVCs) emerged increasingly with companies focusing on core competences which lead to increasing outsourcing of activities which were not considered their core activities (Gereffi et al, 2005; Giuliani et al. (2005). Eventually manufacturing companies were purchasing globally parts, components and systems which they assembled. In this regard just-in-time concepts enjoyed increasing popularity in line with limited storage of parts by end manufacturers. It appeared that original equipment manufacturers (OEMs) possessed a strong competence in assembly of final products using low cost labor (Hobday 1995). These competencies developed also as a result of a large-scale transfer of managerial, marketing and technical know-how along with the off-shored stages (Baldwin, 2016). The parts were often subject to purchasing from specialized suppliers through well-oiled value chains which, in turn, required sophisticated logistics and quality assurance schemes. This process has led to the emergence of supply chains which were featured by a higher degree of activities done offshore but profits accruing to flagship companies which are in charge of designs, brands and marketing at home bases, with Apple's cell phone system as an example.

Emerging in closer proximity to the OEMs in earlier stages, these supply chains eventually spread widely as geographical distance wasn't considered a challenge anymore as networks and logistics developed further. Nowadays cost efficiency became increasingly

important for flagship companies who aimed at taking advantage of scale effects by global suppliers. The latter naturally weren't focused on one customer only but used platform technologies with customer specific modifications thus enhancing production volume while overhead cost remained almost at the same level. The so emerging value chains expanded significantly with the opening of new markets and economies during the 1990s and beyond. This has led to so called "Great Convergence' or catching up of those emerging economies that became competitive by joining global value chains, primarily China, Korea, India, Poland, Indonesia and Thailand (Baldwin, 2016).

This globalisation trend of the past few decades, driven to a large extent by the proliferation of GVCs, has led to yet another set of significant changes in patterns of technology upgrading and especially to new modes of interaction between domestic technology efforts and external sources of technological knowledge. The market opening of countries like China and India, let alone a large set of new countries previously in the "Eastern Block" has led to new dynamics of technology accumulation and interaction among emerging and developed economies. However, technology became less defined by national borders and more defined by the contours of international production networks (Baldwin, 2016). Whether this new dynamic will lead to so-called 'Shifting Wealth II' (OECD, 2014) of continuing increase in the economic importance of emerging economies will ultimately depend on whether their productivity growth will be driven by technology upgrading. What we have seen so far indicates much more differentiated pattern of upgrading with, on one hand, China fast developing along several technology upgrading paths while, on the other, many emerging economies exhibiting signs of 'premature deindustrialization' which poses various challenges of how they technologically upgrade (Rodrik, 2015). Moreover, past experiences show that successful technology upgrading

is not a passive and autonomous process but active and coordinated activity orchestrated by a variety of state and non-state actors under diverse sectoral and national innovation systems leading different specialization patterns (Lee and Malerba 2017). A mere openness is not guarantee of technology upgrading. The interaction with the global economy regarding technology and knowledge exchange is very much country- or sector-specific, but not income-specific (Radosevic and Yoruk, 2018). For example, an IMF study shows that the upper-middle and high-income countries appear to be benefiting from participation in global value chains, while low and lower-middle income countries do not (Ignatenko et al, 2019). Technology upgrading via GVCs does take place but is not universal. It is rather conditional on variety of factors. Thus, many studies have discussed the rationale, extent, scope, and method of policy intervention which can facilitate innovation based growth (Cimoli et al., 2009; Mazzucato, 2013).

After a long hiatus, the role of economic geography in this picture has attracted extensive interest during the past couple of decades. The geography of economic activity in the 21st century represents a key concern for business, policymakers, and academics alike (Audretsch and Belitski, 2017; Audretsch et al., 2006; Saxenian, 1994). In order to thrive, places must be capable of consistently generating wealth, jobs, innovation and opportunities in an ever-changing socioeconomic and technological environment (Katz and Wagner, 2014). This environment is currently being sketched out as combination of the changing global value chains, new locations and natures of entrepreneurial activities, as well as the arrival of the 4th Industrial Revolution (Schwab, 2016).

It is abundantly clear that the world of innovation and entrepreneurship is not flat, as some were quick to claim in the midst of globalization excitement (Friedman, 2006), but rather

spiky: innovative firms and entrepreneurs tend to agglomerate (Stam, 2009; Feldman, 2001; Laemer, 2007; Brakman and Marrewijk, 2008). Moreover, evidence suggests that the impacts of entrepreneurial activity can be mainly felt at the regional level (Acs & Armington, 2004), placing entrepreneurial ecosystems as a key aspect of public policy (Borissenko & Boschma, 2016; Moretti & Thulin, 2013).This is particularly critical in the context of developing/emerging economies which struggle to reach an innovation-driven path for their productive structure and continuous adjustment. Such countries are vulnerable to economic shocks and stagnation or boom-and-bust cycles, one of which is of particular relevance: the persistence of a post middle-income gap, or growth slow-down, that prevents the majority of developing/emerging economies to complete the catching-up process with technology leaders. The location of innovation in these nations is strongly skewed towards a few cities and their metropolitan areas or towards low value-added segments or sectors.

Agglomeration forces lead to clusters that discourages offshoring while dispersion forces encourage geographic unbundling (Baldwin, 2012). The push by GVCs towards dispersion and away from agglomeration (cf. new trade theory) may offer new opportunities but also represent new constraints for technology upgrading of emerging economies. In the world of GVC, comparative advantages increasingly reflect strengths at the level of very specific activities and stages of value chain. The ICT revolution, in particular increasing use of Industry 4.0 linked technologies, has lowered communication costs and thus reduced costs of geographic separation, but automation has also decreased the role of labor cost differentials as factors of competitive advantage and increased possibility for reshoring. The outcome is that proximities and distances started to matter in new ways with flexibility, system integration, environmental impacts and resilience becoming important drivers.

Innovation and entrepreneurship are believed to be subject to increasing returns to scale as a function of agglomeration economies and the existence of a multidimensional socio-economic environment that fosters heterogeneous location of innovation. Moreover, knowledge intensive entrepreneurship (KIE) is highly dependent on local endowments in terms of knowledge, institutions, resources and demand. Yet, innovation systems differ in terms of "entrepreneurial propensity", i.e. the capacity to generate and exploit innovation-oriented opportunities through the creation of new enterprises or the progressive renewal of incumbent firms. This is the underlying rationale of the concept of innovation ecosystems (Radosevic & Yoruk, 2013).

The fact that KIE is deeply embedded in local contexts poses fundamental challenges for both analysts and policymakers, as one-size-fits-all initiatives and analytical models can be deemed inappropriate for most locations (Radosevic & Yoruk, 2013). The economic mechanisms that shape evolutionary trends in technology upgrading and entrepreneurship are not of a linear nature and they are expected to operate differently in distinct locations with varying historical backgrounds and at various stages of development (Boschma & Martin, 2010; Fischer et al, 2018). The evolution of these ecosystems "reflect decades of economic decisions" (Rosenthal & Strange, 2001, p. 218).

In the context of developed economies, enabling conditions are strongly related to physical proximity, understood as an important feature of urban agglomerations providing access to markets and ideas. Densely populated areas provide larger pools of individuals to engage in innovation, entrepreneurship and creative endeavors (Glaeser, 2011; Feldman and Kogler, 2010; Stam, 2009). Large metropolitan areas are, accordingly, expected to have a disproportionately stronger activity of inventors than smaller cities (Florida et al., 2016; Li et al., 2016; Bettencourt

et al., 2007). There is, however, lesser direct evidence and shared understanding for developing/emerging economies (Glaeser, 2014; Fischer et al., 2018; Alves et al., 2019), especially those struggling to overcome the phenomena described by the terms "the middle-income trap" and "catching-up" (Lee 2013; Lee, 2019; Lee and Malerba, 2017). Their efforts to address the multi-faceted challenge have attracted increasing attention to the role of technology upgrading in this process (Radosevic Yuruk 2016). Researchers, policy makers, and practitioners struggle with a number of complex questions, many of which relate on local-global interfaces (World Bank, 2015; Fu et al., 2011; Pietrobelli and Staritz, 2017).

This focus on local-global interfaces is understandable once we recognize that in the 21st century technology upgrading challenges depend much more on improvements in connectivity and on the industrial ecosystem. The platform economy as the emerging business model rests on information and interactions as chief assets. IT industries and digital platforms are profoundly changing the nature of not only information markets but also of traditional and physical goods markets which are driven by system competition and network externalities (Alstyne et al, 2016; Cusumano et al, 2019). How these trends affect technology upgrading of the emerging economies is the issue for the newly emerging research agenda in this area. We are certain that the new competition and new paths of technology upgrading are increasingly based on the increased interactivity but also that production-only integration does not lead to technology upgrading or integration into knowledge changing activities.

It is within this context that we invite readers to consider these four contributions that have been selected into the Special Issue. The paper collection aims at providing insights into some of these complex questions on local-global interfaces specifically as they relate to

emerging economies trying to overcome the post-middle-income gap and to catch up with advanced, innovation-based economies.

Yeon et al (2020) distinguish between two aggregate types of technological capability and the transition related to growth slowdowns in middle-income countries. They use a construct of two capability indices to investigate their heterogeneous contribution to economic growth. These indices reflect a carefully constructed analytical framework that evaluates two types of technological capabilities, namely implementation capability and design capability, developed by different knowledge types and learning modes. Using a dataset based on 42 countries during a 20-year time period the authors show (i) the sequential pattern of national technological capability development from the implementation-based to the design-based; (ii) a positive influence of higher global connections on capability development; and (iii) an increasing contribution of design capability towards economic growth but a decreasing contribution of implementation capability when approaching higher levels of income level.

From the perspective of topic of our Special Issue, Yeon, et al. (2020) paper shows that technological capabilities are cumulative and path dependent but also that there is no automatic link between implementation and design capabilities. Also, increasing global connections positively affect both type of capabilities but the positive impact is significantly higher in the case of implementation capabilities. This result corresponds to other micro level research suggesting that production-only integration does not lead to technology integration or integration into knowledge changing activities. Technology integration will take place only if emerging economies' firms build capabilities to engage in technology upgrading closer to the frontier (Yoruk, 2019; Kale, 2019).

The influence of different types of global engagement on firms' innovation is addressed by Zhou, et al. (2020). The authors use a 3-year panel dataset from the Chinese National High-Growth Firms in High-tech Zones Database. Foreign equity has a nonlinear effect on innovation, with high and low levels of equity having negative while moderate shares have positive effect on innovation. Exporting always positively affects innovation. Academic collaboration on its own has a negative effect on innovation but in interaction with exporting and foreign ownership effects are positive. Also, state ownership strengthens the positive effects of exporting on innovation.

The importance of this paper is twofold. First, it simultaneously investigates the influence of two important types of global engagement: foreign direct investment and exporting. Second, it shows that global engagement of firms is strongly affected by their connection to local institutional structure through state ownership and by their connection to local knowledge base proxied by academic collaboration. In this latter respect, the paper is very much in line with the literature on MNC subsidiaries (Marin and Sasidharan, 2010; Marin and Guliani, 2011) showing that two way linkages with global MNC networks and with local networks are key to substantial technological efforts in the host economy. Zhou, et al. (2020), however, indicate that the local linkages take place trough state owned firms. Based on evidence from China alone raises the question to which extent these results can be generalizable and whether they reflect unique idiosyncrasies of Chinese context, especially the government's continuous support to the acquisition of technology (Petricevic and Teece, 2019). Nonetheless, their results conform to the general point: the interfaces between global connection and local capacity are key for emerging economies to benefit from global engagement.

Figueiredo and Piana (2020) drills into the micro-level learning strategies underlying innovative technological capability accumulation of latecomer firms, particularly in natural resource-intensive industries. The authors address this topic through an empirically grounded study of the Brazilian mining industry, which holds a globally leading technological and market position, and provide in-depth insights regarding latecomer firms' technology upgrading. In support of recent literature (Lee and Malerba 2017), they find that: (1) the examined leading firms implemented technological learning strategies as responses to changing windows of opportunity, such as demand, technological, and institutional windows, and to idiosyncratic problems; (2) these technological learning strategies manifested in various ways ranging from imitative and defensive to offensive and involved two major forms of knowledge: 'doing, using and interacting' (DUI) and 'science, technology and innovation' (STI); and (3) the use of these learning mechanisms changed qualitatively over time affecting firms' technology upgrading intensity positively.

Exceptional values of this contribution is, first, the emphasis placed on the essential role of firms' leadership in responding to signals emanated from windows of opportunities and, second, the role of organizational capabilities and inter-organizational knowledge interactions – both local and international - in technology upgrading. Parallel to the macro-perspective of Yeon, et al. (2020), this paper shows the changing nature of technological capabilities at a micro level. Their ethnological approach also enables the authors to clearly depict how transitions between different stages are being managed along the technology upgrading trajectory. Finally, their case shows the importance of the local control of technological modernization, the issue also addressed by Zhou, et al. (2020).

The topic of control of technology upgrading is also central to the paper of Lebdioui, et al. (2020) who look at the policies associated with the apparent success of two emerging economies (Chile, Malaysia) in embarking on the path of escaping the middle-income trap. Interestingly, the authors find that the newly leading export sectors are not manufacturing (such as electronics) in Malaysia or traditional mining in Chile. Rather, the new engines of growth have been new resource-based sectors (petroleum, rubber and palm oil) in Malaysia and non-mining resource-based sectors (salmon, fruits, wine and wood-based) in Chile, as these sectors have been moving away from low value-adding exports towards upgrading and higher value-added activities.

Moreover, they argue that the sustained growth of these sectors is not the result of open markets alone, but also of specific industrial policy measures that have enabled the accumulation of productive and innovation capabilities through R&D support, fiscal incentives, export assistance, and quality control. The emergence of locally controlled firms is indicated as an important aspect of this long-term success although the sources of the initial learning included foreign actors and foreign direct investment. The cases of Chile and Malaysia, then, point out the possibility of escaping the middle-income trap not through manufacturing – long touted as the escape route – but through high-value-added resource-based development.

A common theme that runs through a rich tapestry of sectors explored in Lebdioui, et al. (2020) paper is that just reliance on global value chains without active transfer and adapting technology to local conditions will not lead to technology upgrading. This requires not only strategic policies but also the emergence of locally controlled firms with organizational capabilities to engage in acquisition and then adaptive mastery of foreign technology. The case of Brazilian mining companies in the paper by Figueiredo and Piana (2020) which have been

able to build organizational capabilities for technology upgrading fits well with the successful examples of the catching up cases described in Lebdioui, et al. (2020).

All papers in this special issue show the importance of active technology upgrading policies. However, they also show that successful policies can range from horizontal policies in the case of Chilean wine industry to the Chinese vertical or strategic industrial policy which relies on state owned enterprises. In a nutshell, presented cases suggest that there are not readymade policy blueprints and that the effective coupling between domestic and foreign technology acquisition is highly contingent on the level of technology development of a country, its institutional context, and the strategies of foreign players. As indicated by Lee et al (2018) there is a dynamic and non-linear relationship between participation at GVCs and upgrading of capabilities of local enterprises. The overall message that emerges from this Special Issue is about 'the importance of managing the local-foreign interface strategically**,** recognizing the positive contribution, as well as the limitation, of GVCs, especially to access foreign knowledge and technology' (Lebdioui, et al. 2020). Alternatively, one could say that globalization is not recipe but opportunity that has to be managed strategically.

While this message comes from the papers produced before the currently unfolding crisis of COVID-19, it is also relevant to the post-COVID period and to the broader understanding of the issues underpinning the strategic geopolitical struggle between the United States and China. These two events together have unveiled that the strategies summarized above, with global value chains at their core, also engender significant risks which stresses the need for reevaluation under somewhat different lenses. It seems that COVID-19 and US-China trade war will only accelerate processes which have been evolving since the 2008/09 Global Financial Crisis. The current

reorganization of the global economy denotes the end of what some observers called the era of hyper-globalization (Rodrik, 2011; Subramanian and Kessler, 2013) which started in the 1990s.

This great reversal has been underwritten by the increasing adoption of Industry 4.0 related technologies and the changing nature of industrial systems driven by Robotisation, Internet of Things and AI. Also, increasing environmental concerns and the greater emphasis on supply chain resilience and robustness in the years to come will significantly impact the nature of technology upgrading as well as the nature of interaction between the local and foreign firms and global value chains. Of course, the importance of design capability (Yeon et al 2020) and local innovation effort (Zhou, et al 2020; Lebdioui, et al 2020) should be considered even more seriously, because the indigenous effort geared for unique innovation will be only way to survive

The implications of these trends for the emerging economies are profound as they are not only about increasing technology gap for a number of emerging economies but also about the changing nature of economic growth. They are about the decreasing relevance of single-faceted economic catchup defined as economic growth unrelated to environmental concerns and sustainability. By nature, the new societal, health and environmental issues are global and will require increased flows of knowledge and technology. Still, the future of globalization is inextricably linked to future of GVC-based global integration. How these two facets of global transformation interact and affect technology upgrading will shape an exciting new research agenda for scholars in the context of emerging economies.

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