



MOVE ON UP!
Building, Embedding and
Reshaping Global Value
Chains Through Investment
Flows: Insights for
regional innovation
policies



Broadening innovation policy: New insights for cities and regions

Move On Up! Building, Embedding and Reshaping Global Value Chains Through Investment Flows: Insights for regional innovation policies

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Background information

This paper was prepared as a background document for an OECD/EC high-level expert workshop on “Building, embedding and reshaping global value chains” held on 21 September 2018 at the OECD Headquarters in Paris, France. It sets a basis for reflection and discussion. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the OECD or of its member countries, or of the European Union. The opinions expressed and arguments employed are those of the authors.

Broadening innovation policy: New insights for regions and cities

The workshop is part of a five-part workshop series in the context of an OECD/EC project on “Broadening innovation policy: New insights for regions and cities”. The remaining workshops cover “Fostering innovation in less-developed/low-institutional capacity regions”, “Building, embedding and reshaping global value chains”, “Managing disruptive technologies”, and “Experimental governance”. The outcome of the workshops supports the work of the OECD Regional Development Policy Committee and its mandate to promote the design and implementation of policies that are adapted to the relevant territorial scales or geographies, and that focus on the main factors that sustain the competitive advantages of regions and cities. The seminars also support the Directorate-General for Regional and Urban Policy (DG REGIO) of the European Commission in their work in extending the tool of Research and Innovation Strategies for Smart Specialisation and innovation policy work for the post-2020 period, as well as to support broader discussion with stakeholders on the future direction of innovation policy in regions and cities.

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Executive Summary

1. The following paper looks at global value chains (GVCs) and global investment flows (GIFs). It focuses how they both can be leveraged for innovation at the sub-national regional level. Particularly its attention is on how regions can build, embed and reshape GVCs to their local enhancement.
2. The paper's chosen approach is three-fold. First, it critically reviews different streams of research in order to identify key definitions and conceptual foundations for the analysis of the link between GVCs, GIFs and innovation at the sub-national and local level. Second, it offers new conceptualisations and critical insights on the regional drivers and impacts of global connectivity, bridging macro-international and micro-firm level approaches. Third, it aims to review empirical evidence and available policy evaluation in order to highlight what works (and what does not) when these concepts are leveraged to shape public policies with special reference to less developed regions.
3. The papers aims to contribute to wider discussions on smart specialisation strategies and in particular on the role regional governments can play in leading the co-creation and capture of value opportunities.
4. The method taken is one of drawing specific links from the GVC, through the governance framework of the Multinational Enterprise (MNE) and its coordinating and controlling arm of Foreign Direct Investment (FDI). Through this conceptual framework, some key actionable lessons can be utilised by regional decision makers. The approach extends to a desire to change the paradigm in regional thinking. Rather than directing FDI into sectors of choice, the changing paradigm will mean regional decision makers should be steering these GIFs into value added task driven activities within sectors.
5. The wider lesson that the academic frontier literature on GVCs and innovation policy for regions shows is that connectivity is key. This is both in terms of firms building connectivity to the GVC in their home region and firms building connectivity to the GVC in a foreign region. Putting up walls and retreating into domestic markets will not make regions better off. Evidence-based cautious openness and internationalisation is important.
6. Any protectionist measures that are undertaken within the connected and reliant globalised context have much higher negative fallout costs. This is due to such policies not only impacting final goods but also on the intermediate inputs. For the OECD these inputs represent on average half of the imports of any given country (Stephenson and Pfister, 2016).
7. However, being open, although an essential component, is not enough. The Washington Consensus view that areas simply need to be macroeconomically sound and open to investment misses critical insights into locational specific heterogeneity (Ponte and Sturgeon 2014). Improvement in areas such as human and institutional capacity are critical to ensure competitiveness along the task driven service section of the value chain and requires governance input (Elms and Low 2013; Drake-Brockman and Stephenson 2012).
8. However, there are also significant regional disparities within countries regarding GVC participation. In order to incorporate relevant benefits of globalisation, regions need to develop a value capture strategy, they must first understand the differentiated preferences and strategies of MNEs. This is in terms of both sectors and GVC stages as well as desire

for knowledge and entry mode. All these complexities result in very varied sub-national geographies of GVC connections.

9. This paper's diagnostic lends itself to discussion with smart specialisation strategies. These strategies can be two-fold. Firstly, looking at boosting current skills and capabilities within the regions' industries, in the GVC story – that of upgrading. Secondly, it is the fostering of new regional diversification strategies within technological domains and potential arising of innovative opportunities (McCann and Ortega-Argilés, 2015). Or in the GVC story, that of building and embedding. Smart specialisation echoes modern thinking about industrial policy as a 'process of discovery' (Rodrik, 2004, 2008). However, a key necessity is not just to discover and innovate, but capture this at a regional level. Smart specialisation is a key necessary element, but it is not enough (Bailey et al 2018). This is in particular when it comes to less developed regions that suffer from an endemic lack of supportive institutions, and technological, administrative and managerial capabilities.

10. A key analytic and diagnostic tool advocated in this paper to connect GVC thinking and a 'smart specialisation' approach to regional innovation policies is GVC analysis and mapping. Mapping regional GVCs is critical for informed decision making on building, embedding and reshaping GVCs. This criticality is also highlighted in the smart specialisation framework. The diagnostic focuses on existing and evolving competitive advantages and deciding how to compete on existing strengths, or whether indeed to develop new ones. Learning how to work with current and future GVC actors and their potential integration is critical. With each region being unique in its circumstances. This exercise will help regions understand how they in particular want to engage with GVCs. Approaches for regions on the technological frontier will differ from those in lagging regions. The former focuses on knowledge connectivity abroad, while the latter on product or process upgrading at home.

11. Once regions are informed, investment promotion agencies (IPAs) seem to be a potential tool at the disposal of policy makers for attracting the 'right' kind of FDI. Evidence has shown that inward IPAs (IIPAs) orchestrated at both the national and regional level can enhance flows of FDI. However, they have a certain critical mass to operate and therefore must be resourced appropriately (Melo and Rodriguez-Clare, 2006). With this ability to target, rather than doing this into sectors of choice, the changing paradigm will mean regional decision makers can direct FDI into value added task driven activities within sectors. Again, these targeted tools can be integrated with regional specifics.

12. Similarly, outward investment promotion agencies (OIPAs) may have a role to play. Looking externally will allow regional decision makers to target related areas of the GVC, seeing as the region itself should benefit from FDI outflows. These benefits are the knowledge connections and access to foreign markets. Regional leaders should provide encouragement to make these connections or engage with national policy makers to make the case. A recent example of this is the UK Department for International Trade's new insurance policy helping UK companies invest abroad with confidence (Fox, 2017).

13. By utilising IIPAs and OIPAs, regional policy makers can address the market failures associated with information problems and take a more long-term view on FDI. This becomes a give and take relationship with both the inward and outward FDI potentially benefitting their region, and not viewing FDI as a one-off transaction.

14. Outlined throughout the discussion is the criticality of linkages to facilitate the GVC connection through to the region. To complement IPAs and in order to bring efficient

linkages between the GVC and region, local content (or linkage) units (LCU) are useful to set up. LCUs are the alternative to implementing laws and legislation. Rather than just written legislation, this relational based approach, working with MNEs, can help provide the local supply chain spillovers. The LCU can account for regional heterogeneity. LCUs are useful in lagging regions. When combined with enterprise mapping, the cognitive distance between MNEs and regions can reduce. These institutional bridges are useful in attracting Emerging [country] Multinational Enterprises (EMNEs). They account for the EMNEs differences in investing preferences. These EMNEs have been shown to represent a large and rising GVC opportunity for regional policy makers in the OECD. Since EMNEs tend to locate where other MNEs are present and engaged in the same activity, regional policy makers should attempt to gain some first mover advantage.

15. These institutional bridges are further evidence that institutions (of many shapes and forms), matter. Although evidence is prominent at the national level, there are further implications for institutional quality at the regional level – it being an important location driver of FDI. Regional policy makers need to be aware of institutional factors in order to influence GVCs.

16. Final implications for regional policy makers surround the proactive search for new knowledge abroad. Active internationalisation of firms and connecting globally is shown to be most effective. This is key to regional innovation and development, not the limitation of firms' internationalisation through the encouragement of reshoring.

17. Building and embedding a region into the GVC does not come without its potential drawbacks. GVCs and FDI are very integrated in their nature and enjoy intense complementarities. Policies and programmes require coordination, integration and consistency for their success (Crespi et al, 2014). However, if approaches outlined by the academic frontier literature discussed throughout this paper are incorporated in regional policy maker's decisions, they will be able to help reshape their region and its interaction with the GVC. For regions it is, "*not only a matter of whether to participate in the global economy, but how to do so gainfully.*" (Gereffi and Fernandez-Stark 2016 Pg.6).

1. Introduction

18. The paper will analyse and critically review an emerging body of research on the link between internationalisation and regional innovation in order to provide new insights for regions and cities on how to build, embed and reshape GVCs and their associated global investment flows in their geographical areas. Therefore large emphasis will be placed on regions and the spatial context of innovation policy in a framework of increasing global integration.

19. The paper's approach will be to provide a current academic frontier by blending both published research and cutting-edge preliminary insights in ongoing research to discuss the following key research questions and themes. It takes motivation from Foray (2015) highlighting that the regional government may have a function to play in the identification, shaping, creation and capture of value opportunities. Similarly, from Bailey et al (2018) and their emphasis on the importance of regions to follow policies that enhance their ability to co-create and capture value coordinated with other entities such as MNEs. In line with Taglioni and Winkler (2016) the paper advocates a new perspective in regional innovation policies, focusing on task driven change rather than sectoral driven change. It provides more active vertical policies showing how the region can interact with the GVC. This is over and above the usual passive horizontal policies necessary for providing a conducive innovative environment for the region. This enhances the objectives of innovation policies from purely technological outcomes to a process of more profound regional change and upgrading.

20. It will begin with both a conceptual and empirical review of GVCs and Global Investment Flows (GIFs) research, in order to understand their emergence, expansion and evolution. In order to draw out some specific what works lessons and actionable policy, the paper will focus on some key actors in the GVC analysis. This will be the MNE and its role as 'lead firm'. The paper will discuss the governance role the lead firm takes in directing the GVC. It will speak to specific mediums of governance and how these mediums interact with value chain links. Following this, it will discuss equity vs non-equity governance decisions and which ones are most of interest for our understanding.

21. Further to outlining the GVC governance role of MNEs, it will then focus down another level, this time looking at how the MNE uses its institutional form to control and coordinate activities abroad – this is through Foreign Direct Investment (FDI). MNEs, through their FDI and wider activities, are important actors in building GVCs. FDI represents the first initial link by which many regions can hook onto the chain. The GVC also shapes which regions are chosen as locations by MNEs for their FDI. This introduces an important paradigm that links together GVCs, MNEs and regions, which will be further explored.

22. Once the flow from GVC, through MNEs and their FDI to the region has been established and conceptually outlined, the paper will discuss the following areas: *Building*, *Embedding* and *Reshaping GVCs* – all through FDI. Specifically, it will identify what room there is for policies to positively affect GVCs. That is to say, how can regions either join GVCs or move up GVCs to more desirable sections. This will be dealt with in *Building GVCs* and *Embedding GVCs* respectively.

23. In the *Building GVCs through FDI* section, the focus will be on locational drivers of FDI. It will first outline the internationalisation of MNE decision making and how

foreign entry modes chosen by the MNE have implications for the GVC. One particular entry mode of interest is greenfield investments discussed thereafter. This is because they represent a type of FDI which provides a high degree of relational governance control for the MNE (Gereffi, 2005). Factors of both location and the firm matter. A brief discussion on how might new technologies such as digitalisation and industry 4.0 change location decisions will close. It will touch upon how the locational drivers of higher value-added activities may be affected.

24. In the *Embedding GVC through FDI* section, the focus will be on innovation impact factors. These will be framed in two ways: impacts resulting from technological diffusion from MNE activities in the host economy, and impacts to the home economy resulting from onshoring and offshoring MNE activities. The positive externalities from the entry of an MNE that can be generated, as well as the benefits that flow back from the MNE – provided there is external connectivity abroad – are key parts of this story. Again, how future technological change might influence this will close.

25. In the final *Reshaping GVCs through FDI* section, the focus will be on public policy factors. Looking at what regional policy makers and decision makers can do in order to action change upon GVCs. These actions are broadly framed as

1. actions for regional leaders, both in
 - a. regional Institutions and
 - b. international dialogue
2. a diagnostic tool to better understand GVCs in a specific region and
3. a direct regional policy looking to be effective to enhance the FDI link with GVCs.

26. These policy actions make a number of changes possible in practical regional policy making. They will alter regional attractiveness to relevant sections of the GVC, reduce barriers to their entry, and understand the region's current place in the GVC. Thereby sketching its future and provide a way in which to implement this future. All these are proactive steps which can be taken in order to influence upgrading in regional jurisdictions.

27. The paper will also highlight key challenges for understanding GVCs at a regional level. There are current knowledge and data gaps that are limiting our understanding of this topic and its operationalisation at the regional level. Some inroads have been made, however OECD and EU countries should undertake further research and data building to enhance future comprehension for evidence-based regional policy making regarding GVCs.

28. Before concluding, key lessons for regional policy makers that emerged throughout the document will be provided and where possible public policy implications will follow. There will be actionable activities for regional policy makers to undertake in order to better understand their current and future relationship with GVCs. One of the areas invoking particular thought is the danger of promoting domestic value chains rather than GVCs. However, due to the contextual nature of regional development and heterogeneity of actors involved, wider generalised lessons will be minimised.

29. We see this paper as a useful step in bringing together various literature streams in one place. Both enhancing a regional and geographical perspective within GVCs and tying this also in international business (IB) by looking at the role of MNEs and FDI. It provides a valuable conceptual framework combining these streams. With increased discussion on smart specialisation strategies and in particular Research and Innovation strategies for

Smart Specialisation (RIS3), this paper is able to provide baseline thinking for input into these strategies.

30. The paper's key message throughout is that connectivity and linkages are critical, especially in learning, adopting and disseminating knowledge in order to promote sustainable development. International knowledge, technology transfer and learning should be viewed as a complement to efforts to build endogenous innovation potential (UNCTAD 2018). The frontier academic literature outlined hereafter provides a picture of cautious connectivity, both with firms linking to the GVC in home regions and building connectivity to the GVC abroad. Evidence based internationalisation is key and more efforts are needed in order to reinforce existing evidence on what works in practice in order to leverage GVCs to promote regional innovation.

2. Key Concepts, Definitions and Emerging Trends

31. GVCs have been extensively conceptualised and discussed in the existing scholarly and policy literature. However, there is limited availability of empirical evidence on the role of different actors involved with the GVC (OECD, 2018), limiting the possibility to leverage the concept for policy purposes in particular at the sub-national regional level. This section of the paper aims to review the existing literature in order to draw some new conceptual links and tie the GVC through its main governance actor, the lead firm. This section will discuss the importance of Multinational Enterprises (MNEs) in this context and how FDI decisions can be seen as the key way in which MNEs can ‘touch down’ to geographic space and link up ‘places’ through GVC connectivity. Finally, it will discuss the sub-national region as the relevant unit of analysis when looking at GVCs. This regional link is important when considering increased thinking on the placed based approach of industrial and regional policy. There is more focus on utilising policy to develop knowledge and innovation opportunities, building upon existing regional advantages and capabilities (Barca et al., 2012). Advocates see potential for regions to move up the value chain, dynamically re-invigorating themselves onto higher growth trajectories (Bailey et al., 2018). This paper will set out why GVCs can have this influence and will place focus on parts of the value chain policy makers can affect.

2.1. Global Value Chains

32. The concept of GVC builds upon the idea of a ‘value chain’. “The value chain describes the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond. This includes activities such as design, production, marketing, distribution and support to the final consumer.” (Gereffi and Fernandez-Stark, 2011 pg.4). Value chains are complex entities with several value-added links. These links or activities comprising a value chain can be based in one single firm or divided across a multitude (Frederick, 2016). The value chain brings together a range of activities; heavy weight is often placed on the manufacturing element, but this only plays one part (Gereffi, 1999b). Value chains make an important addition to the discussed ‘supply chain’. “A chain represents the entire input-output process that brings a product or service from initial conception to the consumer’s hands.” (Gereffi and Fernandez-Stark, 2011 pg.5).

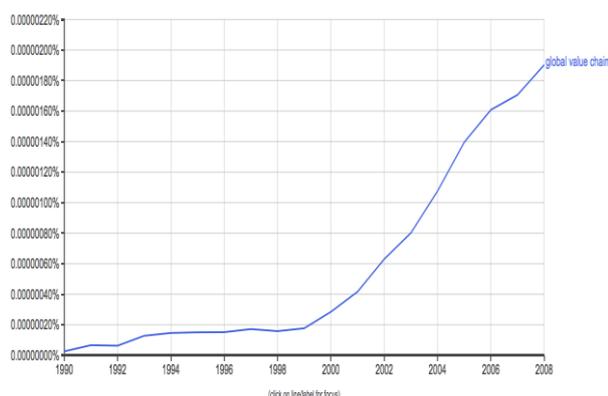
33. A GVC takes the typical value chain concept and places it in the context of global economic integration, enabled – over the past half century - by supportive political and technological conditions. It covers activities that have been carried out in inter-firm networks on a global scale (Gereffi and Fernandez-Stark, 2011). Let us take the example of a simple value chain product such as flowers. Here, a simple value chain would be flowers being grown, wrapped, distributed and sold in one country by one firm. More complex value chains at the domestic level might involve a multiplicity of local/domestic actors with, to continue our example, distribution taking place by a separate specialist firm. The GVC is different- it allows the same processes to take place across many geographical spaces involving many different actors and a sophisticated governance. There could be R&D occurring in one country attempting to produce new rarer breeds of flowers, them being grown themselves in another country, before being packaged and branded in a third. The classic example here is the iPhone. iPhone’s software and product design are done by Apple, most parts are produced by independent suppliers in different countries and different

sub-national regions around the world (Xing, 2011). By going global, there can be significant complexity added.

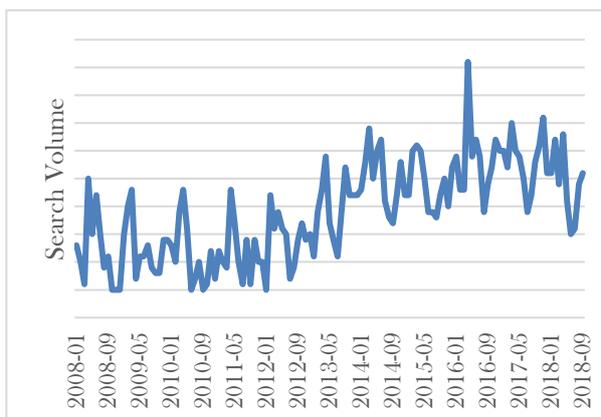
34. GVCs are not solely manufacturing focused. Not only can GVCs map out the production of a good, but they also highlight the different stages and value components required to produce a service (Gereffi et al., 2001; Sturgeon, 2001). Services are important elements of GVCs both in terms of the services required to produce goods, and as final services themselves targeting final consumers. Within this value chain, segments at the lower value end can include basic services in information technology outsourcing and business process outsourcing, while at the higher end there is knowledge process outsourcing that includes market research using specialised expertise (Fernandez-Stark et al., 2011). Consequently, it is important to note that our conceptualisation of GVCs refers both to products (i.e. manufactured goods) and services.

35. The GVC's emergence both as a concept and in economic reality is relatively new. GVCs had less than 200 Google Scholar entries before the turn of the millennium. Since then and 2013, there have been ~13,000 (WTR, 2014) and ~33,000 as of today. Similarly as Figure 1 outlines there a substantial increases in 'global value chain' prevalence in wider literature. Yet, a disconnect can be seen between the increasing importance in academic literature and the frequency of search terms google. Although on an upward trajectory, the increase is not as stark indicating perhaps knowledge and interest in GVCs as well as their role in the global economy has not spread to the wider public.

Figure 1. The Rise of Global Value Chains



Google Book Ngram Viewer (Keyword Term Prevalence in Books) [1990 – 2008]



Google Trends (Keyword Term Searched in Google) [2008 – Present]

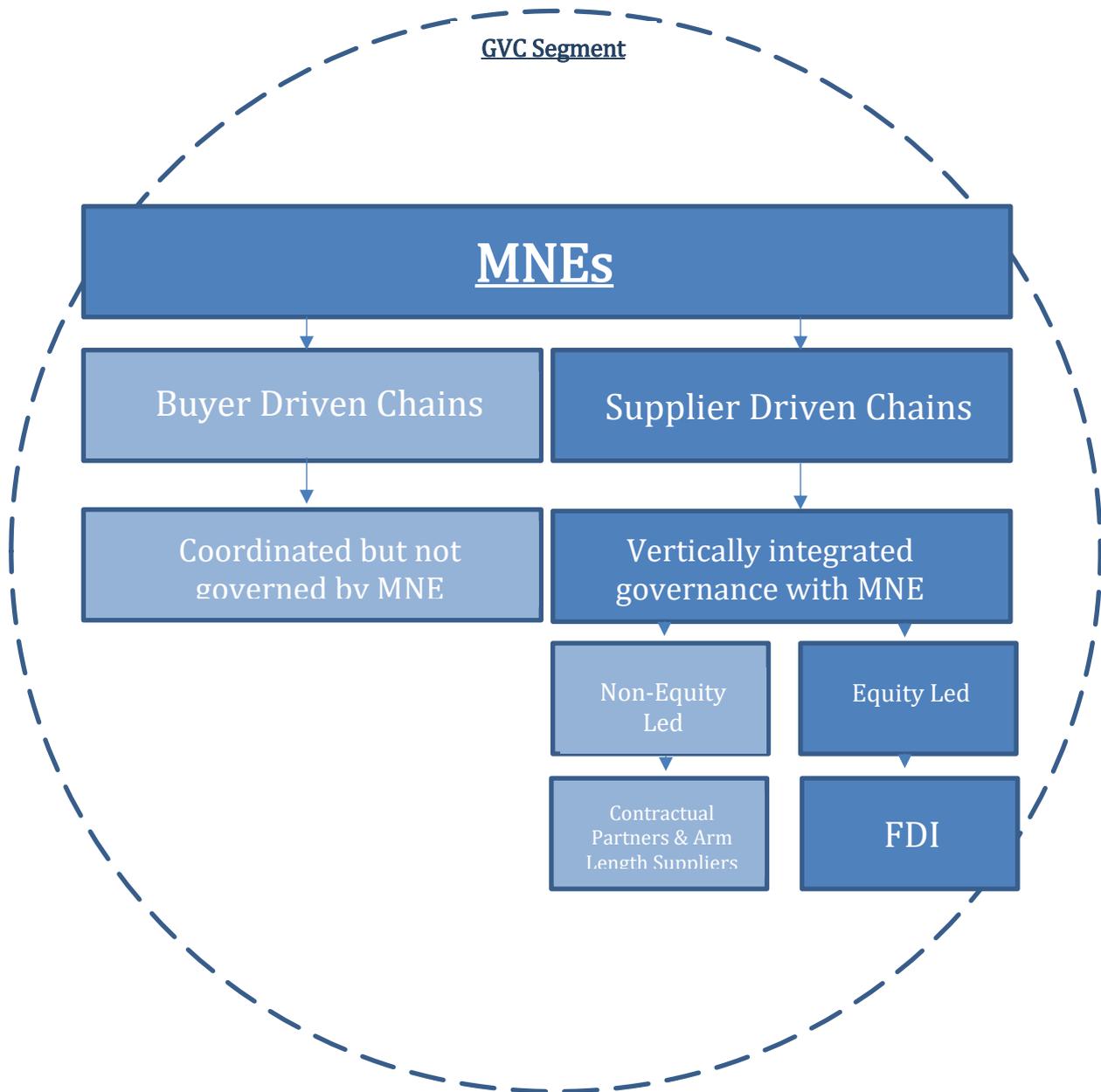
Source: Google.

36. However, its newness as a concept does not mitigate its importance. Gereffi et al. (2005) published a common framework and standard set of terms for GVCs, creating a baseline for much of current thinking. This common framework was based on four dimensions that global supply chain methodology (Gereffi, 1995) explores:

1. An input-output structure – the process of transforming raw materials into final products
 2. A geographical consideration – based on the identification of lead firms in the value chain
 3. A governance structure – how the value chain is controlled
 4. An institutional context – in which the industry value chain is embedded.
37. The initial four dimensions were added to by a fifth, Gereffi (1999a) and Humphrey and Schmidt (2002) together developed an additional analytical element that of:
5. Upgrading – the dynamic movement within the value chain by examining how producers shift between different stages of the chain.
38. The framework provides a comprehensive view of global industries both from the top down and the bottom up. The key concept when taking the top down view is that of ‘governance’, the role of lead firms. The key concept when taking the bottom up view is ‘upgrading’. Lead firms are those that “govern” their global-scale supplier networks. Furthermore, geographical analysis is first based on the identification of the lead firms in each section of the value chain (Gereffi and Fernandez-Stark 2011). They are therefore of critical importance in the GVC story with its link to the geographical space.
39. Regarding GVCs, governance is the “authority and power relationships that determine how financial, material and human resources are allocated and flow within a chain” Gereffi (1994, p. 97). These relationships are in terms of “buyer-driven” or “producer-driven” chains (Gereffi, 1994).
- Buyer Driven Chains. These are used to denote how global buyers used coordination in order to create a competent and coordinated supply base. Direct ownership is not required.
 - Supplier/Producer Driven Chains. These are used to denote vertically integrated supply chains. Here direct FDI by MNEs is central to their evolution (Gereffi, 2001).
40. Buyer driven chains show how important large MNEs are in prescribing standards and protocols throughout their supply chain, particularly in some cases with the MNE having limited production capabilities themselves. Buyer driven chains are more explicitly associated with ‘sourcing’, that is the purchase or sale of intermediate goods. Important for building GVCs, sourcing has less scope in embedding or reshaping GVCs. In comparison, producer driven chains show vertical integration along all segments of the supply chain. They utilise technological or scale advantages from this integration. The lead firm therefore plays a key role in GVC building.
41. These GVCs and their buyer/producer driven chains involve international trade flows. These trade flows can be equity led or non-equity led. The former involve networks of foreign affiliates established via FDI. Altomonte et al., (2012) highlight that foreign affiliates are highly engaged in GVCs. The latter involve more contractual partners and arm’s length external suppliers (Taglioni and Winkler 2014). It is lead firms that are making these strategic decisions, the scope for entering GVCs is not in the hands of countries or sub-national regions. The firm’s governance decisions go beyond core competencies and transaction cost-based decisions. Instead they take into account a complex set of factors that include productivity and sector characteristics when thinking whether to integrate via equity or outsource via non-

equity intermediate inputs (Antràs and Helpman 2004). It is these equity decisions that play a key part in the analysis of GIFs and FDI. Particularly as there is support that equity arrangements promote greater knowledge transfer (Mowery et al, 1996). These equity arrangements allow interfirm 'received wisdom' to occur, (Kogut, 1988) with technological transfer made easier by the interfirm nature of the connection. This extends the boundaries of the firms involved and facilitates the development of appropriate absorptive capacity in both the investing company and its equity partner (Cohen and Levinthal, 1990). It re-emphasises the importance of MNE governance structures and FDI for knowledge transfer in both more traditional vertically integrated 'hierarchies' (Oxley, 1996) and alternative governance structures (e.g. Equity Joint Ventures) in response to the technological challenges of the 'alliance capitalism' (Dunning, 1995). Figure 2 visualises the key area of interest.

Figure 2. Global Value Chains and Multinational Enterprises

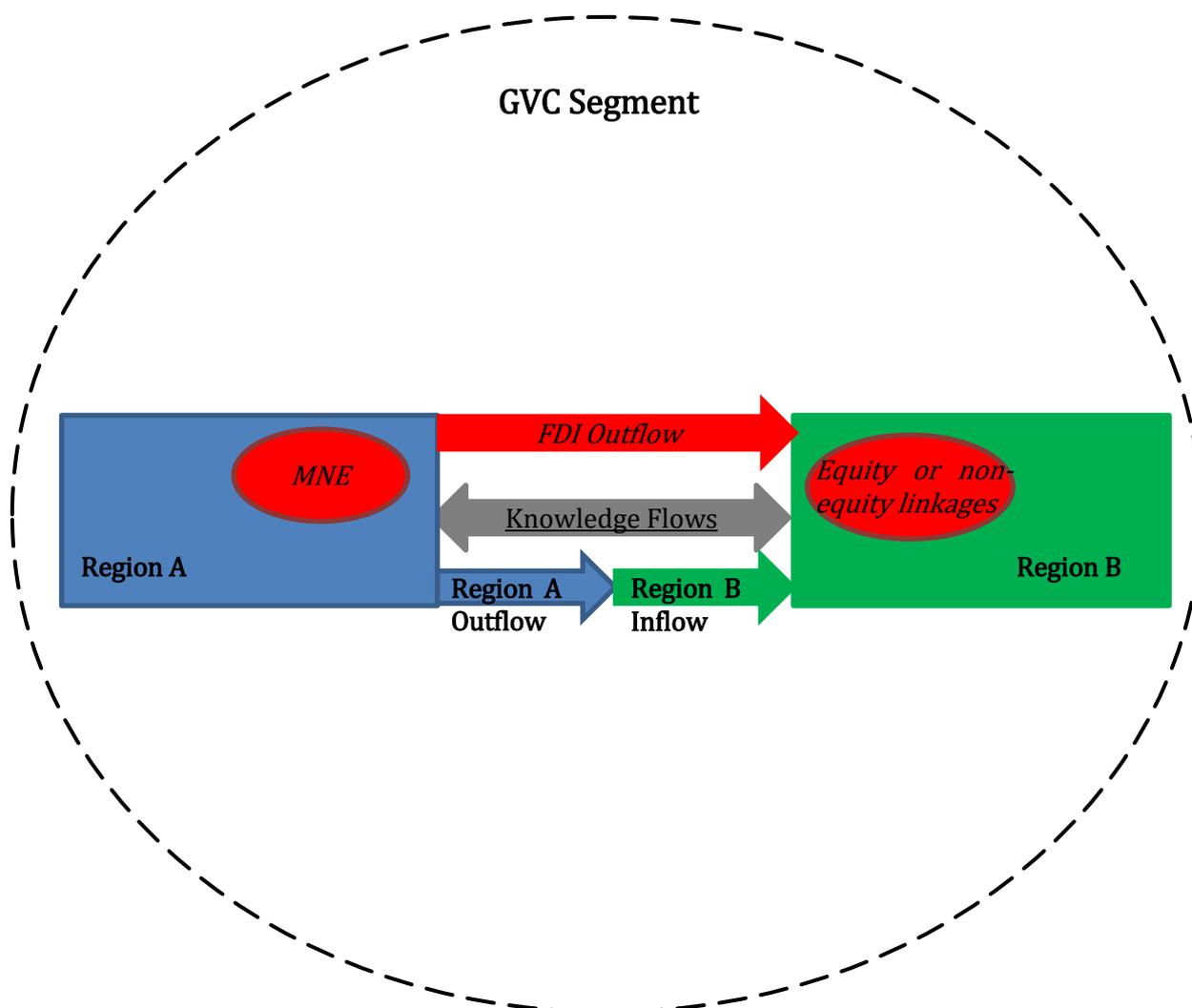


42. Important to note regarding regional influence, at the geographical level, GVCs operate at different geographic scales – from local to global. They embed and ‘touch down’ in many different parts of the world with specific local economic social and institutional dynamics (Gereffi and Fernandez-Stark 2011).

43. The focus of this paper takes its underpinnings from Gereffi’s (1995, 2005) framework. The emphasis on the lead firm, that of the MNE, the link through its governance decisions and the geographical embedding is of key interest. The key fundamentals of our approach can be visualised in the following Figure 3. It highlights how the MNE operates at the regional level, within a GVC. It also shows the outflow nature of FDI, however how this can be viewed as an Outflow or Inflow depending on the perspective of the sending

and receiving spatial unit. Finally, it highlights the potential two-way nature of knowledge flows. This visualisation will be described in detail in the following subsections.

Figure 3. Global Value Chains, MNEs and the Regional Economy



2.2. The governance of GVCs and the role of Multinationals

44. There are a variety of firms that interact in different ways within the GVC. The GVC is a complex, and diverse linked variety of actors. Acknowledging and understanding the heterogeneity of the actors involved is a fundamental step in the analysis of how GVCs are built, embedded and (eventually) can be re-shaped. As discussed above, MNEs play a special role in this context as the key governance coordinator in GVCs by forming multiple asymmetric linkages with varied business partners. The type of these linkages vary depending on segment of the value chain (Ponte and Sturgeon 2014).

45. MNEs have a critical role in the global economy. Together they account for one third of global output and world GDP as well as being responsible for half of global exports (OECD, 2018). Some have argued that the growing fragmentation of production seen within GVCs in the past decades has been driven by MNEs (OECD,2018). They are also

believed to be behind the global dispersion of knowledge – the second unbundling (see Baldwin, 2016). The reduction in cost of moving ideas was an enabling factor in offshoring production. Following the offshoring of production and (knowledge-intensive) networks, jobs were dispersed, and with this, knowledge diffused.

46. However, the actual position and role of different actors such as MNEs has been underexposed. This has been in part due to limited availability of empirical evidence (OECD, 2018). By looking at the governance of GVCs and the role MNEs play, we can build further understanding of their connections and linkages.

47. Historical theories of MNE distinguish between horizontal and vertical foreign integration. On the one hand, MNEs focusing on horizontal linkages gain from economies of scale by ‘seeking their market’ (Franco et al 2008, OECD 2018). Literature on market seeking motivations shows market location factors such as GDP per capita, population, specific customer segments available and geographically linked richer regions are all key attractions (Flores and Aguilera, 2007; Loree and Guisinger, 1995; Beugelsdijk and Mudambi, 2013; Crescenzi et al. 2014). The subnational characteristics are shown to matter. On the other hand, MNEs focusing on vertical linkages are ‘seeking efficiency’. The MNE is attempting to provide inputs at the most cost-effective level. This is done by moving and undertaking different stages of production in various countries (OECD, 2018). It is these vertical linkages which attempt to build, embed and reshape GVCs, which are important for our thought process. The MNE may be attracted to certain sub-national efficiencies such as the availability of desired skilled (or unskilled) workers (Disdier and Mayer, 2004). Some MNEs may also be ‘strategic asset seeking’, searching for host locations with unique knowledge related assets. These assets are often highly localised in a smaller number of sub-national units such as Silicon Valley in the US or Cambridge in the UK (see Cantwell and Piscitello, 1999; Dunning, 2009; Iammarino and McCann, 2013) and are of particular interest to emerging MNEs seeking new knowledge (see Bertoni et al. 2013; Buckley et al. 2007).

48. The typology of these linkages and level of integration between the MNEs and GVCs can be conceptualised by looking at the five basic types of value chain governance developed by Gereffi et al., (2005): ,

1. Markets – a simple form with markets containing firms and individuals who have limited interaction with one another when buying and selling products/services
2. Modular value chains – suppliers in modular value chains producing to specific customer demands
3. **Relational value chains** – network style requiring deeper mutual dependence. Trust, relationship and/or spatial proximity are important
4. **Captive value chains** – characterised by a high degree of control by lead firms, with smaller suppliers being transactionally dependent on much larger buyers
5. **Hierarchy** – a more traditional approach where substantial vertical integration means ‘transactions’ are taking place within the firm.

49. MNEs fit in around relational value chains, captive value chains and hierarchy. These require respectively larger degrees of coordination and power asymmetry (Gereffi and Fernandez-Stark, 2016). MNEs have firm-specific advantages that they may want to internalise, in order to do so certain governance structures are more effective than others, depending on the motives driving internationalisation decisions. For instance, hierarchical

vertically integrated value chains facilitate internalisation that only co-location can bring in other governance structures (Ponte and Sturgeon, 2014).

50. The typology also, through including network governance as opposed to just economic governance helps to show why, in today's global economy MNEs increasingly seem to function as networks within the international production networks of GVCs (Forsgren et al., 2007; Dicken, 2015). This power in different types of governance ties back with the aforementioned supplier/producer driven chain and the role of FDI in coordinating their evolution.

51. There is a focus shift from horizontal towards more vertical MNE activities in GVCs. (OECD, 2018). With this, the idea gaining promise is that trade and investment have become rather complements instead of substitutes. *While often described as "two sides of the same coin", (Krugman, 2007), trade and investment seem to be intertwined in a more complex manner within GVCs (OECD, 2018 pg 31).* However, currently the evidence base cannot provide enough detail to fully analyse the trade – investment nexus within GVCs (OECD, 2018). The focus of this paper will therefore be on FDI and global investment flows.

2.3. GVCs, MNEs and Foreign Direct Investment

52. There is an outline that the MNE will invest through FDI if they have one (or more) of three types of advantages. We know this outline and their advantages as the Ownership, Location and Internalisation (OLI) framework (Dunning, 1977; 1980; 1988; 1993). This foundation of global investment flows is important to understand in order to build a GVC layer upon it.

53. An ownership advantage is something the MNE 'possesses'. It provides them an advantage abroad to overcome their unfamiliarity with local conditions. Examples are often found in the realm of technology and knowledge.

54. A location advantage is something the MNE 'desires' that ties them to a specific location. In other words, it is an advantage specific to a certain location. Examples are potential inputs such as knowledge base and high human capital or alternatively, a demand factor such as the size of the potential market.

55. An internalisation advantage is something the MNE 'acquires'. It ties in activities integrating them vertically to the company's internal organisation, as opposed to externally contracting them. This advantage is most important when thinking of MNE's equity vs non-equity investment decisions.

56. However, when analysing MNEs in the context of GVCs, we need to develop further thinking on the MNE's FDI decisions.

57. It is these MNE decisions with their associated linkages and relational governance that the lead firm can use to expand its domestic and foreign value chain operations. MNEs are well placed to take risk and seek out locational advantages. They are the driving force behind most variants of firm governance in GVCs. This is done through their investment, outsourcing and offshoring activities (Dunning and Lundan 2008, and Aldonas 2013). Domestically, this expansion can occur through the headquarters of the MNE, developing supply chain networks and linkages with SMEs or with new production plants. SMEs are drawn into GVCs through the provision of intermediate inputs or service-based tasks (Elms and Low, 2013). Whereas abroad, this expansion is typically undertaken through a foreign affiliate, expanding equity based FDI or non-equity outsourcing. In order to guide and

enhance regional dynamics there is a need to determine and support key ‘vehicles’. FDI is one of these vehicles (Bailey et al 2018). FDI is generated by firms, when viewed from their perspective they imply the circulation of physical capital, human capital and knowledge between the headquarter and its subsidiaries. IB literature also places emphasis on the role of internationalisation and innovation. Their increased interconnectivity and the role FDI plays in the cross-border transfer of knowledge and technology (Cantwell, 2017). However, it is important to be considering geography. When placed in a regional perspective FDI can occur as both an inflow to the region i.e. an MNE starts a new activity in a foreign region that hosts it or an outflow from the home region i.e. activities offshored by a local company towards a foreign region, with different (perceived or actual) local impacts. Therefore, when looking at MNEs & FDI, the combination of these two streams of research, both the GVC & IB is useful for understanding regional innovation.

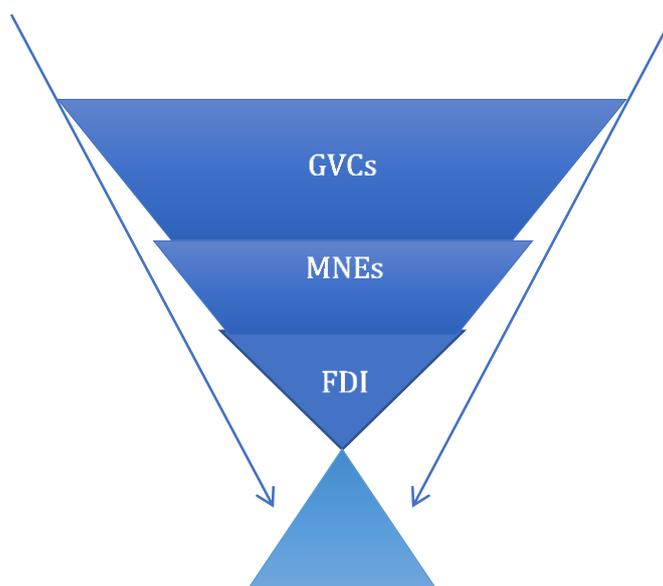
58. With this vehicle, the MNE can build, embed and reshape GVCs through the Global Investment Flows (GIFs) they establish. It is through these GIFs that regions can benefit from GVCs. Therefore, we must discuss this key MNE tool – Foreign Direct Investment.

59. Foreign Direct Investment (FDI) is one of the institutional forms that MNEs can use to control and coordinate activities abroad (Buckley, 2009; Cantwell et al., 2010; Beugelsdijk et al., 2010; Narula and Dunning, 2010). Although motivations for entering foreign markets have more recently changed (Giroud and Mirza, 2015). The increased fragmentation and modularisation of strategic MNE activity has altered investment decisions. These decisions have, with GVCs, evolved over time (Dunning and Lundan, 2008). A slight refining of FDI motivations illustrates location choice can also depend two other elements. Firstly, on value chain segment. Secondly, on the governance modality utilised by the MNE when participating in a host economy (Giroud and Mirza., 2015).

60. The relationship between FDI and building GVCs is that FDI represents the first initial link by which many regions can hook onto the chain. FDI represents the interaction between the globally acting MNE and the spatially constant region (Prasad et al., 2003). It also represents the access. The relationship between FDI to embedding GVCs is through FDI’s ability to facilitate the transfer of capability (Prasad et al., 2003). Therefore, some discussion must take place within the MNE as to what key activities and capabilities should be kept at the headquarters and which should be relocated to benefit from certain regional endowments. There are however, a certain set of conditions that make some decision making easier than others (Morgan, 2004). These conditions and link can result in some more innovation prone interactions and institutions more likely occurring in some localities than others. Since different functions are delocalised by MNEs, there are therefore different levels of local embeddedness required (Dimitratos et al., 2009; Jordaan, 2009; Rugman et al., 2011). Depending on the part of the value chain that will be being re-located, the MNEs locational preferences will differ (Crescenzi et al., 2014). Or in other words, the relationship between FDI and regions is shaped by the GVC.

61. Figure 4 provides a visual representation of our focus. Taking one element of the larger GVC – the lead firm; one element of the lead firm - its FDI flows and how this relationship interacts with the region.

Figure 4. How FDI link GVCs and Regional Economies



62. There is also a link between GVC participation and FDI. The GVC Participation Index looks at ‘upstream’ and ‘downstream’ participation expressed as shares of the country’s total exports (Koopman et al., 2014). It measures a country’s involvement in the vertically fragmented production as both a user and provider of foreign value (Taglioni and Winkler., 2016). If a country lies upstream in the GVC then it is involved in producing raw material or manufactured inputs for others. Downstream countries rely more heavily on other country’s intermediates to produce final goods for export (Koopman et al., 2010). Global investment flows are able therefore to influence a country’s GVC participation through the nature of their investments. Until 2012, GVCs had shown two decades of growth (UNCTAD, 2018). However, since then, despite these large flows, GVC participation actually decreased. This was across all regions, developed and developing. This GVC slowdown is clearly correlated with a slowdown in FDI which also occurred. It reaffirms the strong impact FDI has on global trade patterns.

63. It is therefore even more critical that regional leaders grasp how to best benefit from FDI flows in and out of their region. Particularly, the newer and increasing sums of FDI emanating from emerging countries. This represents a new opportunity with underutilised GVCs.

2.4. The Regions in GVC & FDI

64. The region as a sub-national unit of space identified by relevant institutional/administrative (e.g. Landers in Germany or Regioni in Italy) and/or economically functional boundaries (e.g. Travel-to-Work Areas in the United Kingdom or Metropolitan Statistical Areas in the USA) is a critical unit when drawing links with the GVC in-between the macro-national level and micro-firm perspective. GVCs ‘touch down’ or are ‘built’ in any different parts of the world and are embedded within local economic, social and institutional dynamics (Gereffi, 1995; Gereffi and Fernandez-Clark, 2011). These local conditions make a significant contribution as to how effective insertion into the GVC is and highly heterogenous both between and within countries. There has been recent regional policy growth of ‘smart specialisation strategies’ with) approach now linked with

value creation and capture (Bailey et al., 2018). This is based upon the notion that regions have the ability to build spatial competitive advantages and generate new specialisms through the “*discovery of new domains of opportunity and local concentration and agglomeration of resources and competencies in these domains*” (Foray, 2015, pg.1).

65. Since we are focusing on global investment flows, the locational factors of the flows matter. This is both where the outflow originates from, for example the MNE Headquarters (HQ) but also, where the inflow reaches, for example building a foreign ground up greenfield investment. Regions therefore take a different perspective regarding FDI to that of firms. It is this direct conceptual link with the region and the insights shared throughout this paper follow this trend. Actionable change is much clearer through this mechanism of influencing global investment flow decisions. FDI is also much easier to measure and track in comparison with GVCs in their entirety and complexity. With GVCs it can be difficult to show clear trends given available data and methods, particularly regarding specific intangible resources (Todeva and Rakhmatullin, 2016). On the other hand, empirics show there are two contrasting stories with the evolving FDI picture. One of inflows and one of outflows. The former, as a world total has grown from under \$1,000Bn in 2005 to \$1,430Bn today, largely driven by developing countries now representing half of all FDI inflows (UNCTAD 2018). The FDI outflows though, are still dominated by developed economies. To a large extent competition to attract FDI has intensified in parallel with this surge in recent decades (Fernandez-Arias et al., 2001). We can trace these flows, their home and host regions and the associated patterns of dispersion and concentration.

66. To find out concrete local policies we need to think beyond that of the national unit. This is in part due to theory needing to better examine the different levels of geography often seen within MNE operations (Iammarino and McCann, 2013). Also, since different characteristics of value chain stages have different effects on location decisions (Crescenzi et al., 2014). The aforementioned traditional location drivers play a different role and instead, softer locational drivers are important (Fuller, 2005) such as, the existence of various institutional supports or innovation system characteristics. These drivers are particularly important in sophisticated GVC functions such as R&D or design business services (Alcacer and Chung, 2007; Chidlow et al., 2009; OECD, 2011).

67. It has been shown that inserting a cluster into a value chain can be transformative for that cluster (Humphrey and Schmitz 2002). Following this intuition, the paper will show how linking a region with a GVC can be beneficial. There is marked differences of GVC integration by region (OECD, 2018).

68. Framing regional decision-making thinking in line the conceptual outline above, will enable the following ‘what works’ interventions to be more effective. Without drawing this link from the GVC to the MNE and then to the regional setting via FDI, these otherwise transnational actors would not be able to tie in to an influenceable area.

69. GVC integration varies substantially both between and within countries. Generally, most countries lie between 15% and 25% integrated in GVCs. However, the shares across regions within a country can in many cases fluctuate by a further 10 percentage points each way. This integration story has remained fairly stable over time with limited converge. While the top quarter of regions harbour more than 30% of their value added from economic activities within the GVC, with the bottom quarter it is closer to 11% (OECD, 2018).

70. These global FDI figures and MNE expansion are useful to provide a wider global picture. However, at the regional level there are specific disparities that are useful to highlight. Crescenzi and Iammarino (2017) show that intra-country FDI can vary in stock and yearly change considerably. Inflows and outflows can increase at different rates e.g. Wschodni and Północno-Zachodni in Poland or indeed move in opposite directions e.g. Mecklenburg-Wester Pomerania and Baden-Wurtemberg in Germany. These connectivity disparities and differing trajectories are not unique to Europe. Regional concentration and stock of FDI shows similar in country heterogeneity in both Russian and Brazil (Crescenzi and Jaxx 2017).

71. The policy action that this alludes to, is explored hereafter. It will be discussed how this lack of GVC participation convergence can be altered and how regional decision makers can utilise these global investment flows for their benefit. So that they may build, embed and reshape GVCs.

2.5. Changing the Perspective – Old Paradigm vs. New Paradigm

72. The increasing fragmentation of the global economic system over past decades, broadly been driven by MNEs has changed its economic makeup. Today, more than half of world manufactured imports are now intermediate goods. This may be primary goods, semi-finished products or parts and components. Furthermore, upwards of 70% of world services imports are intermediate services (De Backeri and Miroudoti 2013). Intermediate goods and services are therefore a key part of global production and GVCs. Instead of sectors themselves, it seems to be the way goods are produced and the quality that may be defining matters (Lederman and Maloney, 2012).

73. That is to say, before moving further, evidence points towards a new perspective of thinking. The integrated nature of the global economy means we can no longer look at regional production through a sector-driven lens. That is, looking at how to move from low or high value sectors focusing on the final good. Goods in the same sector can be produced with very different technologically driven tasks. Backward technology that has limited skill intensity in one country, or instead modern, skill intensive technology in another country (Rodriguez-Clare, 2007). It is the tasks that matter.

74. The fragmentation of production associated with GVCs has now provided cross-country firms the opportunity to engage in global trade – unburdened by the necessity to develop the full range of vertical capabilities across the value chain themselves (Gereffi 2014).

75. Therefore, when viewing the GVC and its potential benefits we should have a task-driven lens, looking at low or high value activities within sectors, focusing on the intermediate good (Taglioni and Winkler, 2016).

76. Critically, we must place thought on two other elements.

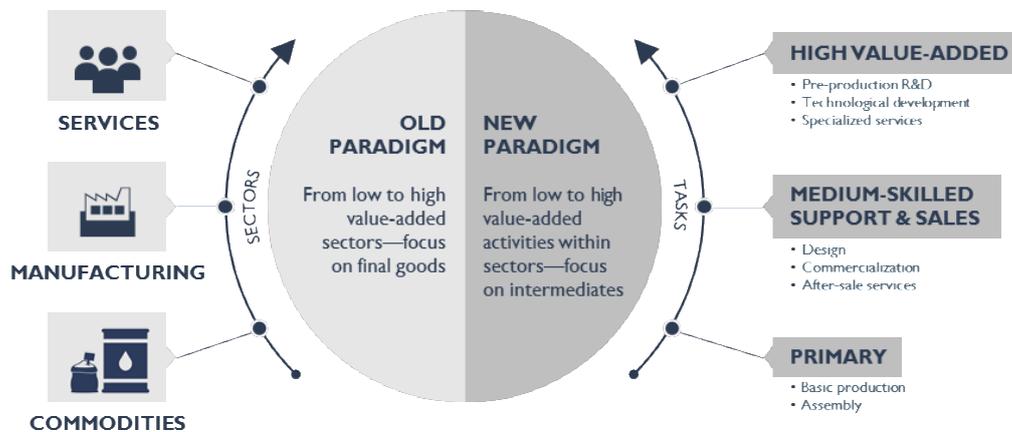
1. Linking to the GVC
2. Moving up the GVC

77. Linking with the GVC is the process of **building** the connection – the region's *locational* factors. Moving up the GVC is the process of **embedding** the connection – and enhancing the *impact* upon the region (Gereffi, et al., 2011; Gereffi and Fernandez-Stark 2016). GVCs have denationalised comparative advantage therefore locational factors have become more important. A firm's location choices are after all, task specific (Taglioni and

Winkler, 2016). Similarly, they represent a key opportunity for upgrading regional skills and competitive offering with dynamic improvements in regional innovative networks.

78. The paradigm must change from thinking only of tangible production to other intangible inputs into the GVC. These include but are not limited to, research & development (R&D), design, marketing, branding and distributing. Figure 5 highlights this visually with the changing way to see industry development. The old paradigm on the left shows the development trajectory that was previously followed. One of moving from agriculture, onto manufacturing and finally services.

Figure 5. Old Paradigm vs. New Paradigm in Regional Development and Innovation



Source: Taglioni and Winkler (2016). Making Global Value Chains Work for Development.

79. However, the shift in developing thinking onto the new paradigm means instead upgrading into high value segments of the industries in which regions have already established expertise. This new perspective in a GVC-oriented world results in an industrial policy based on specialisation in specific functions and has important implications for our understanding of regional development and innovation.

3. Building GVCs through FDI: Regional Locational Factors

Box 1. Key Messages for Policy Makers – Building GVCs through FDI

1. In building links with GVCs, tying onto MNEs internationalisation efforts is critical for potential innovation benefits.
2. MNEs can build GVC linkages with the regional economy through both M&A and greenfield investments
3. Both national and regional level conditions matter for regions to link up to GVCs through FDI
4. There are no one-size-fits-all recipe for success. Location choices depend simultaneously on the characteristics of the investing company (including its own ‘home’ regional environment), on the nature of the investment (including its GVC position/stage) and on the characteristics of the host region.
5. Building institutional bridges and the subsequent reduction of cognitive distance between local actors and foreign companies is key to facilitate the matching of the ‘right’ firms in the ‘right’ regions in a highly heterogeneous environment
6. The re-organisation of MNE activities along the value chain in response to new technologies might negatively affect less developed regions where often less sophisticated tasks are pursued

80. For a region, building the link to the GVC is the first key step in utilising it for regional benefit. Without that connection, they remain unlinked to the chain, unable to embed or reshape for local value creation. Since GVCs are built through the actions of firms MNEs are integral in this process. More specifically, one of the key ways GVCs can be built is through the internationalisation efforts of MNEs as they delocalise activities beyond national borders. Regional policy makers can leverage these locational factors to attract FDI and help connect the region to the GVC.

81. The attention placed on the locational factors of host economies have changed with the recent trends in the types of activities that are moving abroad through FDI. MNEs have moved from locating less knowledge intensive activities, such as standardised production, outside of their home country (Dunning, 1996) to locating more knowledge intensive activities and sophisticated business functions foreign shores. For example the inclusion of increasingly autonomous R&D units in foreign subsidiaries. By spreading abroad R&D activities through FDI, new architectures of innovation are being created (Schmitz and Strambach, 2009; Massini and Miozzo, 2010; OECD, 2011). As more complex activities relocate abroad, regions can connect to different parts of GVCs. These new knowledge connections and increasing knowledge flows subsequently stimulate the innovative activity within the region (Grossman and Helpman, 1991).

82. A growing body of research has looked at the major regional influences in the relocation of different business functions of MNEs (Defever 2006, 2010; Basile et al., 2008; Canals and Noguer 2008). Less has been undertaken specifically on knowledge and innovation factors and on how location drivers vary according to the value chain stages of

activities (Crescenzi 2014). Understanding the heterogeneity of investment drivers along the stages of the value chain is a key pre-condition for the design of value-chain-oriented regional development and innovation policies.

3.1. Understanding the Internationalisation of MNE Decision Making

83. As discussed in the ‘Concepts’ section the OLI framework provides a general understanding of the three types of advantages that drive firms internationalisation (Dunning 1980; 1988; 1993). When viewing this framework from a regional perspective, it is the ‘L’ or location that matters. These are the factors that link MNEs to a spatial unit and are factors that can be affected by the regions themselves. Crucially, the internationalisation process involves finding the optimal ‘sorting’ between the characteristics and advantages of firms and locations. This process – traditionally conceptualised and analysed at the national level – is fundamentally shaped by both national and sub-national factors (McCann and Mudambi, 2005; Iammarino and McCann, 2013; Ascani et al., 2016).

84. Recent management and strategy work has attempted to combine firm and location characteristics into a joint framework. Alcacer and Delgado (2016) look at the internal and external drivers of location. Internal (within the firm) drivers lead to firms co-locating activities within locations. Whereas external (outside of the firm) drivers push firms to locate activities in new locations. Alcacer and Delgado (2016) explore these forces domestically but the same line of reasoning can be applied to the international expansion of firms’ activities. Consequently, international location decisions of different functions (from the most sophisticated to the more routine activities) can be understood as the balance between internal and external drivers, which consider simultaneously both firm and location heterogeneity in organising the value chain in space (Arnold et al., 2018).

85. There are different ways that firms looking to internationalise can enter a foreign market. This choice of foreign entry modes has been widely investigated in international management (Werner, 2002) and international economics (Nocke and Yeaple, 2008). As noted in Section II, our main interest is on equity rather than non-equity investments. A commonly explored part within the entry mode literature looks at the ‘foreign establishment mode choice’ (Cho and Padmanabhan, 1995), which consists of two main entry modes for equity investments. First, firms can enter new countries and regions through mergers and acquisitions (M&A). An acquisition involves a partial or full equity purchasing and therefore ownership of an *existing* firm (Barkema and Vermeulen, 1998; Larimo, 2003). Second, firms can enter foreign markets through greenfield investments, which means building a completely *new* subsidiary, with the subsidiary being either a joint-venture with another company with complementary assets or a wholly owned subsidiary by the MNE (Barkema and Vermeulen, 1998; Buckley and Ghauri, 2004; Cooke, 2013). The entry mode choice depends on the characteristics of the investing MNE and the host economy. The majority of studies explore the host economy at the national level, with less known at the sub-national level. Nocke and Yeaple (2008), looking at US firms, argue that greenfield is generally favoured over acquisitions when the parent firm is more efficient, the host country is less developed, and when there is a closer geographical proximity between the parent firm and the host economy. Firm characteristics matter.

86. The foreign entry mode chosen by MNEs can have important implications on the GVC since it changes the composition of firms in a region. From a GVC perspective, greenfield investments are interesting because the creation of new economic activity can help connect different activities, economic actors and regions and ultimately help build

GVCs. Investments can also take place in the form of Mergers & Acquisitions (M&A), however much less is known in the literature about the regional drivers of such investment. For clearer lessons, the rest of this section will therefore focus on greenfield investments as a tool for building GVCs. The role of other (regional) entry modes will be further discussed when looking at regional impacts and highlighting knowledge gaps.

3.2. GVCs and Greenfield Investments

87. Greenfield investments represent a type of FDI which provides a high degree of relational governance control for the MNE (Gereffi et al, 2005). The literature has converged on a set of key factors when looking at these FDI location decisions and therefore the built link with the GVC. These factors can be put in two sections. Factors on the location side – that of the host region to FDI and the home region to FDI. Also factors of the investor side – that of the company.

88. On the location side, a large body of evidence suggests that institutions matter (Globerman and Shapiro, 2002; Kinoshita and Campos, 2003; Bénassy-Quéré et al., 2007; Daude and Stein, 2007; Du Caju et al., 2008). Bénassy-Quéré et al's (2007) shows that it is the host country's institutional quality – in terms of both formal and informal constraints (North, 1993) – that is an important location driver of FDI. Particular prominence is placed on bureaucracy and corruption. The results provide a sense that raising the quality of institutions and in particular, converging them towards those of FDI source countries may help the receiving of flows. This outcome may be important for lagging regions to note in their pursuit of FDI flows and building that link to the GVC.

89. Location factors are at play for both the national and regional level with much of the literature has focusing on the former. Accounting for the regional level can bring in another dimension of heterogeneity as location side heterogeneity interacts with heterogeneity on the firm side. On the side of the investing company, firm characteristics also affect the local attraction of regional economies. Alcacer and Chung (2007) find heterogeneity based on the R&D expenditure levels of investing companies. Some firms who have low levels of R&D expenditure tend to invest in locations where there is high industrial innovative activity. On the contrary, those firms in which high levels of R&D expenditure already exist, instead are attracted to locations with high levels of academic activity but not necessarily industrial activity. They want to distance themselves from competitors and avoid the possible cost of outward spillovers. Additionally, Duanmu (2012) looks at firm characteristics by comparing location choices made by state-owned Chinese MNEs and private Chinese MNEs. It is found that state-owned MNEs place less weight on the political risk of a host economy, and are more concerned with favourable exchange rates. Hence firm characteristics and strategies influence locational preferences for MNEs (Helpman et al., 2004; Buch et al., 2005; Cantwell, 2009).

90. Further to this, it may not only be the characteristics of the firm that affect the locational decisions. Instead it may be the types of activities within the chain that the company performs (Crescenzi et al 2014). Looking at EU-25 regions, results suggest that for the most sophisticated knowledge intensive stages of the value chain regional socio-economic conditions are critically important when firms are making decisions. These soft factors at play show that national and regional levels perform different roles. This is particularly true when considering the organisation of the value chain and the role of MNE subsidiaries (Rugman et al. 2011).

91. The emerging picture from the literature is that when looking at locational factors, the heterogeneity of the firm and its type of activities is critical. This is even the case with formal economic institutions, the heterogeneity of the firm is still critical. It emphasises the importance of decision makers to understand their socio-institutional fundamentals when looking at building the GVC.

92. Finally, an important way of viewing the combination of location and MNE characteristics comes from the literature on countries of origin, specifically on cases where MNEs are from emerging countries (EMNEs). In this literature, firms are assumed to be partly a function of where they originate. Here, characteristics of the home region are thus used to proxy for firm characteristics. As highlighted in Section I, an increasing amount of FDI comes from emerging countries. It is generally agreed that MNEs from advanced countries possess different features to MNEs from emerging countries (Kumar and McLeod, 1981; Lall et al, 1983). Given that MNEs' location choices are partly determined by their characteristics, MNEs from advanced countries may prefer different locations to MNEs from emerging countries (Cuervo-Cazurra and Ramamurti, 2014; Hyun, 2008).

93. EMNEs are particularly motivated to internationalise to access strategic assets, such as often-superior knowledge (Bertoni, et al., 2013; Ramamurti, 2012), that are not domestically available (Awate et al., 2015). Subsequently they undertake explorative investments in the hope to catch up with global leaders in the field (Dunning, 1993; Meyer, 2015) by improving their global competitiveness.

94. In order to study location choices of EMNEs at the regional level, Crescenzi et al., (2016) look at greenfield investments into the EU regions. They find that when EMNEs are conducting innovation related activities abroad, they are drawn to EU regions with high technological capabilities. Further to this, EMNEs tend to locate where there are other MNEs present and engaged in the same type of activity. This means that they can maximise their learning due to proximity to similar companies as the cognitive distance is lower.

95. This is critical for regional policy makers to understand for three reasons. Firstly, they can attract large and increasing FDI flows from emerging markets by providing a highly technological regional environment. Secondly there is a level of first mover advantage in the engagement of similarly profiled EMNEs. Finally, if regional policy makers can support the removal of cognitive distance between themselves and EMNEs by building 'institutional bridges' it will be to their benefit.

3.3. Heterogenous Drivers of Location Choices & Their Evolution

96. In summation, there are a number of heterogenous drivers of location choices when building GVCs through FDI. Their sources are split between the firm, the home region, and the host region.

97. Firstly, firm drivers refer to the set of firm characteristics that create their locational preferences. These can include, to name a few, the pre-existing geographical footprint of the firm, the firm's technological capabilities, the pursued entry mode, and even the country of origin. Where the firm originates is a particular case of firm heterogeneity and is often used to stylise and proxy for characteristics internal to the firm. These sets of explicit and stylised firm characteristics can generate different locational preferences for investments.

98. Secondly, the characteristics of host regions are important drivers in determining where MNEs decide to locate their investments. Institutions of host economies are studied as a way of determining the types of locations in which MNEs prefer to locate. Another

key host region driver is the technological environment provided. Some MNEs seek to locate in highly technological environments, while others may locate lower value added tasks that may not require this.

99. There are therefore sources of heterogeneity at both the firm and locational level. They interact with each other and both influence preferences regarding location choices.

100. New technologies may be influencing these location drivers in new ways. These may be regarding factors of production and factors of R&D.

101. New technologies on the rise might influence the location decisions of the MNE. Conditions of low productivity and low forecasted growth rates in many developed economies have increased discussion on the ‘Fourth Industrial Revolution’; particularly on how to further drive economic growth through AI and robotics (Morikawa, 2017). Fitting into the GVC story, it is useful to think with regards to value added across tasks and remain thinking in the new paradigm.

102. It is easy to think that MNEs will have lower incentives to pursue lower labour costs abroad. Instead they might locate production where automation may more easily occur. Taking this occupation approach, Frey and Osborne (2017) estimated about 47% of total US employment faces the risk of computerisation and this might affect the organisation of both domestic and GVCs. However taking the new paradigm task-based approach, it is instead estimated that only 9% of jobs in 21 OECD countries face computerisation (Arntz et al., 2016). In this perspective, the re-organisation of MNE activities along the value chain in response to new technologies seems less challenging for growth and jobs.

103. However, despite this 9% figure, the spatial impacts may be asymmetric across regions. Less sophisticated tasks are typically pursued in less advanced regions. If automation will displace these less sophisticated tasks then some of the aforementioned internal and external location drivers may be affected. Regions potentially affected are twofold. Firstly, those who previously competed with each other on low labour cost, high job count, low value-added production tasks – typically further away from the technological frontier. Secondly, those with high labour cost, very low job count (i.e. one individual overseeing a system of autonomous machines) – typically closer to the technological frontier. These regions may soon find themselves competing for the same tasks. MNEs may now find themselves having to make FDI decisions between these areas.

4. Embedding GVCs through FDI: Regional Knowledge and Innovation Impacts

Box 2. Key Messages for Policy Makers – Embedding GVCs through FDI

1. Regional embedding of GVCs can occur from both foreign firms bringing activities to the host region as well as domestic firms offshoring activities to other regions abroad.
2. Heterogenous firms enter regions in heterogenous ways. Their effects upon regional characteristics can be highly differentiated. Regional policy makers must be cognisant of this in order to capture and embed knowledge spillovers and externalities.
3. Offshoring R&D does not hurt innovation that instead would be taking place at home. Instead such international investments increased MNE innovation activities in the home region.
4. A ‘proactive search’ of new knowledge, that of policy driving active internationalisation of firms is shown to be most effective. Regional policy makers should not limit the international expansion of domestic firms through encouraging re-shoring as they will miss out on important knowledge streams.
5. A key challenge for public policies in less developed regions remains how to facilitate collaboration, learning (and upgrading) by local firms from

104. Once the locational factors driving the link to the GVC through FDI have been established, thought must turn to embedding the MNE in the host economy. As MNEs have begun to delocalise certain varied functions, varying degrees of local embeddedness and local linkages can occur (Dimitratos et al., 2009; Jordaan, 2009; Rugman et al., 2011). The regional impacts from embedding GVCs through FDI will be framed in two ways: (1) those that technologically diffuse from MNE activities in the host economy, (2) those that can flow back from MNE activities that have been offshored. Put another way ‘*to combine embedded and local assets with international sourcing and outsourcing*’ (De Propriis, 2008 pg.1). The positive regional impacts do not just benefit the region receiving FDI, but also the region providing it.

105. Bailey et al (2018) utilise Markusen’s (1996) analogy describing embedding GVCs into regions a process of making them become ‘sticky places’. The role for regional government is to help regions re-invigorate themselves. By changing their growth trajectory to one that is more dynamic, their activities will become more embedded and more difficult to shift elsewhere. GVCs are after all, “*embedded within local economic, social and institutional dynamics. Insertion in the GVC depends significantly on these local conditions*” (Gereffi and Fernandez-Stark 2016 pg.14).

4.1. Technology Diffusion and Innovation in Host Region

106. MNEs are regarded as actors who are endowed with knowledge and technology. They are seen to outperform the domestic counterparts in the host economy who can be

regarded as less productive and innovative (Castellani and Zanfei, 2006; Criscuolo et al., 2010).

107. When entering into a new host economy, the inward FDI can act as an 'externality-generator' (Javorcik, 2004; Xu and Sheng, 2012). MNEs unable to fully internalise knowledge and technology create 'spillovers' (Markusen, 2005). Therefore, there is the possibility for positive impacts to accrue from a region tapping into the GVC via FDI. However, actual linkages between the foreign firm and local actors must be developed for local impacts to materialise: FDI leading to GVC embeddedness is not a foregone conclusion. The 'branch plant' syndrome with limited local linkages from an MNE entry (Hood and Young, 2000; Phelps et al., 2003; Phelps and Waley, 2004) – is always a possibility. Further, if the domestic sector is not adequately technologically advanced, potential knowledge flows will not be assimilated domestically. The MNE does not really work for the host region as a link to GVCs if what we can call 'reactive connections' do not occur.

108. There are specific mechanisms through which MNEs can impact host economies (Blomström and Kokko, 1998; Görg and Greenaway, 2004; Smeets, 2008; Crespo et al., 2009; Crescenzi et al., 2015): demonstration effects, competition effects, labour market effects, and backward and forward linkages. These impacts are typically seen through productivity (Caves, 1976; Blomström and Kokko, 1998; Aitken and Harrison, 1999) and innovation (Cheung and Lin, 2004; Fu, 2008; Antonietti et al., 2015; Crescenzi et al., 2015; Crescenzi and Jaax, 2017). Recent studies explore the regional implications of MNEs' activities and their integration in GVCs. It is important to note, increased productivity may facilitate, in turn, a structural shift towards higher value-added activities (Farole and Winkler, 2014).

109. As highlighted in Section II, greenfield investments have important governance links with the MNE and the GVC. However, as well as differences within types of firms embedding in the regional network, there are also varied entry modes. Following literature showing that the links that already exist through acquired firms may allow greater spillovers than new linkages through greenfield investment (Chapman, 2003; Crespo and Fontoura, 2007; Balsvik and Haller, 2010), Crescenzi and Jaax (forthcoming) look at those differing links in Latin America. They find that greenfield investments are not the only type of investments regions should hope to attract. M&A investments can offer a more direct channel for knowledge diffusion. The relative importance of which depends on the local conditions and efforts, the GVC position of the country and the GVC stage of the investment. This is interesting as the importance of the subnational's input into the design of innovation policies is growing in Europe and also, for example in Latin America (Pietrobelli and Rabellotti, 2006; Koeller and Cassiolato, 2009; CAF, 2010; Maffioli et al., 2016). With the GVC lens, regional firms being on the receiving end of M&A deals is not a negative thing. It is instead an opportunity for the creation of knowledge spillovers. The stronger link M&A shows between patenting and investments suggests the prior embeddedness of M&A projects may facilitate knowledge diffusion (Crescenzi and Jaax, forthcoming).

110. Therefore, there are different types of firms that enter the regional economy, but also these firms enter with different modes. The effects can be highly differentiated depending on investing company characteristics. On top of this there are also specific regional factors that determine the effect. It is this heterogeneity between the firm and the regional features that shape impacts.

4.2. Offshoring & Innovation Consequences in the Home Region

111. Knowledge flows can also occur back to the regional economy via the GVC from ‘outward’ connections elsewhere. These connections can be categorised as either outsourcing or offshoring. The key differences between the two are in the control over and location of the connected organisation. The choice of governance mode may provide different access advantages as well as organisation efficiency gains (Kedia and Mukherjee, 2009; Metters, 2008). However, importance of equity investments in our discussion means it is offshoring that is of key interest.

112. This offshoring is a form of embeddedness, however of a different type. The lead firm is now connected to an offshore region and there are knowledge flow benefits. This knowledge can come in the form of offshoring and co-location of both production and R&D – the latter being of most interesting in the innovation story. It is worth emphasising the two-way nature of offshoring. Offshoring from the providing region’s perspective may be seen as technology diffusion from the receiving region’s perspective.

113. MNEs may take part in both material offshoring and service offshoring. The former looks at the relocation of production activities such as assembly. The latter looks at the relocation of service activities such as call centre operations, accounting and key in the discussion on innovation, that of R&D (Crinò, 2009). Existing literature tells us many motivating reasons why an MNE might outsource their R&D. These fall into three key categories.

1. To support other stages of their value chain located in foreign markets (Criscuolo, 2005; Santos-Paulino, 2011; Dachs et al., 2013; European Commission, 2014).
2. To access knowledge that is otherwise unavailable to them in the domestic market (Criscuolo et al., 2005; Howells et al., 2008; Jabbour and Zuniga, 2016).
3. To reduce the cost of their R&D investment – by outsourcing, sharing fixed costs and relying on specialised providers (Tapon and Thong, 1999).

114. This frontier thinking provides the other side of the picture when thinking about regional embeddedness in the GVC. It should not just be the seeking of embedding GVCs at home, that regional decision makers should focus on – but also embedding those abroad. The connectivity benefits that can benefit the region can work both ways and geographic proximity is not always necessary (see Bathelt et al 2004).

115. When innovative activities are relocated, regional policy makers should not view these moves as a loss of innovative economic activity, for they can also gain from them. Co-location between different parts of the value chain is another possibility for embedding the GVC. Defever (2010) tells us that firms locate different stages of their value chain near to each other. This is in the hope to save on coordination costs and benefit from complementarities. Related activities concentrate in the same country – close to each other. Defever (2010) finds that this is the case for R&D activities and production plants, which favour co-location strategies. It is the geography of prior investments that firm’s location decisions are largely dependent upon. Firms in general tend to reinvest and thus co-locate in the same region they have invested before. However, there is heterogeneity along the value chain. That is to say, it is only the nearby location of production plants that is important for production activities. Service activities on the other hand do not need such physical proximity to other functions. Belderbos et al (2016) derive a similar conclusion. Looking at where co-location with production matters in GVCs they find that having prior manufacturing activities increases the probability of R&D investment following in the

same location. Furthermore, offshoring R&D does not hurt innovation that instead would be taking place at home. Instead such international investments actually increased MNE innovation activities in the home region. They are complementary and the knowledge flows across borders via the MNE network. There is clearly a link between foreign locational activities of MNEs and offshoring, however they are not one and the same. Offshoring does not only take place within MNE boundaries and similarly MNEs do not only pursue offshoring activities (Crino, 2009). What also matters as much as co-location in space and geographical proximity is a combination of social, cultural and economic factors. These together engender trust-based and informal relations necessary for knowledge flows (De Propris et al., 2008).

116. The work addresses concerns that offshoring of production activities will see innovative activities follow. There seems to be no direct ‘push’ for firms to follow with innovative activities, rather what is seen is a ‘pull’ of foreign locations for R&D. This might be due to the offshoring of R&D tapping into knowledge pipelines otherwise unavailable to home regions and their firms. De Propris et al (2008) highlight that the competitiveness of local production systems increasingly depend on their ability to combine and embed local assets with international sourcing and outsourcing. The following preliminary insights provide a new insight into foreign market access and external knowledge.

117. MNEs motivation to offshoring R&D is on the rise (Nieto and Rodríguez 2011). The literature has been capturing this change. Initially it was focusing on innovation in terms of knowledge spillovers between geographically close actors in a local production network (for example: Porter, 1990; Cooke et al., 1997; Jaffe et al., 1993; Audretsch and Feldman 1996; Iammarino and McCann, 2006). More recently, innovation has been discussed in terms of trans-local cooperation, and externalities flowing across a different geographical scale. (for example: Bathelt et al., 2004; Belussi et al., 2010; Chiarvesio et al., 2010; Turkina et al., 2016; Schotter et al., 2017). Following this lead, currently results from Elliott et al’s., (2018) study looking at 6,000 French firms between 1999 – 2011 show the offshoring of R&D activities can be a useful tool for firms in accessing and exporting to previously untapped knowledge sources. Without this connection firms may be missing out on critical value abroad. It reemphasises the importance of instead focusing on domestic value chains, the embedding of truly GVCs in a region can provide new trading opportunities.

118. Further to this, more evidence comes from the US in Crescenzi and Ganau’s (2018) current study looking at sub-state economic areas and innovative regional environments. Regions, as a result of increasing global connectivity, are able to develop new competitive local strategies and identify new trajectories for local development (Bair and Gereffi, 2001; Crescenzi and Iammarino, 2017; De Marchi et al., 2018). This re-configuration particularly can happen through the access of externally generated inputs, unavailable locally. It is also important for GVC embedding. As, when subsidiaries are embedded in their host regions’ economies as well as their global intra-firm networks, MNEs play the role of channelling knowledge across borders (Iammarino and McCann, 2013).

119. In order to enhance these environments and subnational economic areas, a ‘proactive search’ of new knowledge by following a policy of active internationalisation of firms is shown to be most effective. It matters more than any investment connections established domestically. Regional policy makers should not limit the international expansion of domestic firms through encouraging re-shoring. This can undermine the very thing they want by putting up an obstacle to regional innovativeness and competitiveness.

There is a real danger that in pure promotion of domestic rather than GVCs, regions, both lagging and frontier will miss out on important knowledge streams and trade avenues.

4.3. Heterogenous Impacts of Embeddedness & Their Evolution

120. The regional innovation impacts associated with the activities of foreign firms are highly heterogeneous. This diversity of impacts depends on a number of interrelated dimensions: the characteristics of the investing company, the nature and objective of its investment (including its value chain stage) and the characteristics of the host economy (from the macro-national institutional environment to the regional meso-level innovation system to the absorptive capacity of domestic firms). These sources of heterogeneity are not independent from each other and are bound by the strategic choices of firms often under the influence of public policies. When reflecting on how regions can link up to value chains by embedding foreign investments these sources of heterogeneity become of fundamental importance. Embedding foreign activities generates highly diversified regional innovation impacts. How positive and negative effects are balanced ultimately depends on the interaction and alignment of the heterogeneous characteristics and strategies of investing companies, their activities/investments and their host (national and regional) economies.

121. A large body of research has looked at these factors but often in isolation, while their dynamic interaction is key and is receiving a growing attention. For example, when looking at the characteristics of the investing companies, the literature suggests that firms aim at minimising knowledge leakages from their foreign activities while maximising their reliance on intra-firm knowledge sources (Alcacer and Chung, 2007). Following this lead, Crescenzi et al (2018) compare whether the greatest innovation benefits to regions are derived from investments by the most highly innovative (patenting) foreign companies, or whether more medium-ranked innovative foreign investors might be more beneficial to their host regions. This research shows that in aiming to attract foreign investment into their region and hence embed in a wider value chain, it is important to not fight for the big-name tech giants. These firms are in fact less likely to bring local benefit and generate local innovation on the whole. Technological giants are more effective at minimising knowledge leakages and have less incentives to interact with the local eco-system. The cognitive gap between these highly innovative firms and local firms may be too large for any knowledge transfer. The local firms will stay largely excluded from the GVC. Therefore, when seeking links with the GVC, to get the greatest innovation impact from their link, engagement should be with medium-ranked innovative foreign investors that might offer the highest local returns via labour circulation, collaboration and spillover/demonstration effects.

122. The literature has also highlighted potential negative impacts of FDI. This should serve as a warning to all regions, but particularly those that are lagging. Technology may not transfer and embed to all regions in the same way. Studies in transition economies show unless direct equity affiliate links were made, limited spillovers were seen Konings (2001). In some country cases international R&D spillovers occur, however in others, some crowding out of local firms in the same industry is seen (Damijan et al., 2003). Likewise, Aghion et al (2005) find that yes, FDI in technology can boosting innovation. However, this was only seen with domestic firms who already had a high level of innovation and could compete. For those firms without this high level of innovation, likely enterprise would not continue. There are considerably heterogenous impacts of embeddedness, with effects and impacts not always the same.

123. New technologies may also affect the way that both positive and negative effects are balanced in different types of region. There are embeddedness impacts from the home

region and embeddedness impacts from the host region. With the former, the varying linkages and technological diffusion provide different impacts. With the latter, the new offshored connectivity brings new proximity and ties in the home region with potential new knowledge sources of the host region. The effects are therefore highly differentiated depending on characteristics of the region and of the investing company. Moreover, firms can undertake different types of investment in different entry modes that add another dimension of heterogeneity. It is the interplay between the company and regional features that ultimately shape impacts.

124. Regarding embeddedness more generally, it does not always mean geographical nearness (De Propris et al., 2008). It is not only co-location that matters. There is a role of concrete personal relations and networks in generating this closeness (Granovetter, 1985). It is useful to embed GVC thinking in terms of Boschma's (2005) wider proximity framework. Proximity that matters is the cognitive, organisational, social, institutional and geographical proximity. This relational embeddedness of firms is the crucial element within regional networks. The systems rest on embedded and strong trustful socioeconomic linkages (De Propris et al., 2008). For without it, there will be limited creation and diffusion of new knowledge (Maskell and Malmberg, 1999; Capello and Faggian, 2005). Furthermore, any co-creation may not be able to be captured in part (Pitelis, 2012). Regarding regions further afield in embedding GVCs, it is the connectivity to non-local agents that can provide knowledge inputs as a key driver of regional innovative performance (Maskell, 2014).

125. There is little evidence surrounding new technologies and how they will change the way in which we understand the regional impacts of GVCs. Questions remain whether increasing industry 4.0 will see the reshoring of activities in a different way.

126. One discussion is occurring about automation. Robots explicitly take up a different part of the value chain. The very nature of automation leads itself to more standardised services and therefore jobs in specific locations. In this case, the reshoring of certain activities may not lead to the reshoring of jobs.

127. This changing composition of employment is likely to vary between countries. The 9% estimated job losses through automation previously mentioned by Arntz et al (2016) is heterogenous. In Korea it is 6% and this compares to 12% in Austria. The key message for regional policy makers and in the context of GVCs is the importance of regional upskilling. The exposure to robots has different effects on wages for different skill level of employee (Dauth et al., 2017). Rather than some of these workers actually losing their jobs, workers may only need to adjust their tasks. We discuss a diagnostic tool utilised to achieve this in the following section.

128. Another discussion is occurring about deep learning. Cockburn et al., (2017) find strong evidence of a shifting importance of application orientated learning research. That is a movement away from routinised human R&D to that of predicative computer driven algorithms. Although potentially rewarding for individual companies, from a GVC and regional perspective the change might have a potential distorting effect. This may firstly warp the decisions regarding why an MNE might outsource their R&D to another region. However, it may also inhibit the region's ability to fully capture knowledge spillovers.

129. This discussion related to a final thought on how new technologies might affect embeddedness is around the labour market effects of knowledge spillovers. As discussed, these are one of the important drivers of spillovers and diffusion of knowledge from FDI investment. The process of workers moving from one firm to another and bringing with

them new knowledge. Autonomous robots and the data driven nature of Industry 4.0 means the ability for human transfer of knowledge is much negated. Although there may be less labour market effects in knowledge diffusion. Aghion et al., (2017) in their preliminary study highlight artificial intelligence may in fact facilitate learning and imitation of the technologies utilised across firms, activities and tasks. Knowledge externalities may occur in a new form – something requiring further thought. The effects of GVC links and their implication for innovation at the regional level may therefore change.

5. Reshaping GVCs: Policy Implications

Box 3. Key Messages for Policy Makers: Reshaping GVCs

1. Regional institutions have a role to play in guiding and reshaping GVCs utilising the ‘key vehicles’ of MNEs and FDI. However, less work has been undertaken in the area. It is unclear how defined regional institutions are and although their role regarding GVCs crucial, its detail is blurred.
2. Regional leaders need to be more involved in international agreements such as free trade agreements and rules of origin. Firms’ differing location, size and sector means these agreements may have different implications on neighbouring regions. In their impact through the GVC, they are far from spatially neutral.
3. Diagnosing the regional specific GVC characteristics such as geographical influence and stakeholder activities through mapping is very useful to ensure a region is approaching the correct MNEs with the appropriate FDI vehicles and have a path for regional innovative upgrading.
4. Investment Promotion Agencies, both inward and outward are critical tools at the regional policy maker’s disposal to account for firm and locational heterogeneity when looking at reshaping GVCs in their areas.

130. Reshaping GVCs is important as it is the process of governments creating the best possible environment to facilitate the insertion of their firms into GVCs. In this sense, proponents have suggested this GVC policy agenda is a domestic one (Stephenson and Pfister, 2016). The previous sections of this paper show why the region should lead this facilitation. There is increasing adoption of newer targeted industrial policies, which, through specific interventions would see governments managing their FDI inflows and directing them into sectors (or tasks) of their choice. Such parts of the value chain would be on the receiving end of deliberative targeted promotional efforts (Draper and Freytag, 2014). Regional decision makers therefore have the ability to develop specific skills, relevant technologies and markets, as well as develop partnerships. These will help create investment and provide opportunity for upgrading investment and innovation (Singh, 2014).

131. However, as well as designing policies to influence participation and positioning of local firms, there is a necessity to simultaneously work with other governments at national and international level regarding GVC rules at the systemic level (Stephenson and Pfister, 2016). It is these agreements that influence the firm’s ability to trade and invest within GVCs. Regional decision makers must ensure their voice is accounted for.

132. Reshaping GVCs therefore is an important part of the discussion on regional economic development and innovation strategies. The policy implications are broadly framed as both long term fixed and short term flexible. The former fix the region’s operating environment, the rules of the game. The latter provides flexible tools regarding how the region interact successfully within that framework.

133. They are:

1. actions for regional leaders, both in
 - a. regional Institutions and
 - b. international dialogue
2. usage of a diagnostic tool to better understand GVCs in a specific region and
3. usage of a direct regional policy looking to be effective to enhance the FDI link with GVCs.

134. Generally, to gain the benefits of FDI and international technology transfer for the beneficial development of host economies, there is a requirement. This is for modern institutional and governance structures as well as conducive innovation systems (Fu et al., 2011). Depending on the stage of the investment, the national and the regional levels have different roles to play. This is when considering where MNE subsidiaries will fit into the organisation of a wider GVC (Rugman et al., 2011). There is further a role the region can play regarding leadership. Both regional governments and public agencies can help align industrial policy with structural change (Lee and Malerba, 2017).

135. To understand their ability to capture value, regions need to diagnose where their current competitive advantage is (Bailey et al., 2018). This identification and positioning of a region in comparison to its peers can be described as developing a ‘brand’ on a certain place (Konzelmann et al., 2018). The region should strategise to position itself successfully, unique from other regions, but also develop itself in a way that considering the ‘fragmentation’ (Venables, 1999) of value chains does not leave it stuck in one part. Mapping and diagnosis is therefore a necessary tool.

136. In attracting MNEs or lead firms in the GVC, to a region, positive spillovers and linkages do not necessary occur. Technological differences, absorption capabilities amongst other factors matter. Therefore, tools to help invite and provide the right kind of FDI, with the right kind of firm on the other end will enhance the link and the connection with the GVC.

137. The process of reshaping and guiding dynamics at a regional level involves recognising and enhancing the ‘key vehicles’. It is through these vehicles, which can include FDI and MNEs that international competitiveness can be fostered. Together, in the co-creation of this regional value, regional government cannot take a passive role, particularly if they want to engage and upgrade these engagements with global markets (Neilson et al., 2014; Bailey et al., 2018). The following sections detail why reshaping is important and needs to be driven at a regional level.

5.1. Regional Leadership

5.1.1. Regional Institutions: In the National Framework

138. Formal and informal institutions generally matter for FDI flows (World Bank, 2017) and consequently they are also important factors in shaping and reshaping GVCs through FDI. IB scholars also note that institutions can shape the behaviour of MNEs and the behaviour of MNEs can shape institutions (Cantwell et al., 2010). Therefore, there might be a potential circular role that institutions can play in reshaping GVCs and vice-versa that deserves careful consideration.

139. If regional policy makers want to increase the chances of embedding and reshaping GVCs in their regions then the capacity of both national and regional institutions is critical.

Knowing this, regional leadership can play a role in delivering and promoting institutional change that works. This can be done by improving the overall business environment of the region and the country or pushing legislation to improve intellectual property rights. It would be hoped regional leadership should act for national benefit. However, this may not be the case, with regions instead acting in their own interests. Territorial competition as noted in Western Europe in the early 1990s (Gordon and Jayet, 1994; Cheshire and Gordon, 1996) is still seen today in the U.S.A with Amazon's new HQ bidding process. The competition can result in MNEs extracting some form of rent through offered incentive packages, or as is being seen, Amazon's feedback starting to dictate regional policy (Garfield, 2018).

140. Further to this territorial competition, some regional leaders are starting from very different institutional contexts (Rodriguez-Pose, 2013). Those less developed regions may have very different capacities to those at the frontier. It is therefore difficult to determine the roles they can play. Good institutions act as the umbrella for delivering the further policy implications and the emerging picture is one where national institutions may shape GVCs. There is lots of evidence on the role of national institutions in attracting multinationals, however less knowledge on regional institutions. A large part of this is due to the conceptualisation and definition of institutions. Also, the lack of data availability at the regional level forces measurement to be done instead at national level. However, regional institutions may play an even bigger role in shaping GVCs when considering that national institutions can be too distant and detached from organisations to effectively influence their behaviour (Rodriguez-Pose, 1999, 2013). The actual role that regional institutions play in reshaping GVCs and the behaviour of MNEs through the attraction and shaping of FDI is likely to be crucial, but it remains more blurred and deserves further future attention. Furthermore, the practical actions that work in order to improve regional institutions that are not functioning are even more limited. For now, the policy implications for reshaping GVCs highlighted should be taken on by those in regional leadership positions – sub-national prominent officials working with national authorities.

5.1.2. Regional Lobbying: International Agreements & Embedding GVCs

141. Recent decades have seen the proliferation of cross-country free trade agreements (FTAs). FTAs can distort sourcing decisions through two channels: both lower tariffs when importing from FTA partners and Rules of Origin (RoO) (Conconi et al 2016). Rules of Origin need sourcing a certain level of inputs to take place within the free trade area to allow tariff free export. By distorting sourcing decisions, they are reshaping GVCs. The implementation of NAFTA RoO have led to a considerable reduction in imports of intermediate goods from countries not engaged in the FTA relative to NAFTA partners (Conconi et al 2016).

142. Currently, virtually all lobbying firms support FTAs of some sorts. Larger firms and those engaged with international trade are more likely to lobby in favour of the best possible arrangement given their strategic objectives (Blanga-Gubbay et al., 2018). Yet, there are various implications. Once entering into FTAs, SMEs may find it too costly to comply with RoO. Further to this, larger MNEs may have to reshape their global supply chains if they want to continue exporting duty free. Given the within-country heterogeneity in the location of firms of different sizes and active in different sectors the implications of different types of agreements are far from spatially neutral in terms of their impacts through the GVC.

143. Although this may be perceived as a macro phenomenon, there is a subnational role to play. Regions have the potential to work together in inter-regional networks to reshape GVCs. Through forming regional groups with similar interests, they should be able to influence how macro GVC agreements are shaped and alter the GVC framework to account for their heterogeneity. Likely benefits could arise for them by lobbying and ensuring FTA brings benefits to their value chains. Regional innovation policy needs to reflect the regional needs, understanding how any international FTA would affect their regional firms. Considering how GVCs have led to increasingly fragmented and dispersed production processes across countries, it is no longer as easy as ‘free trade wins over all’. Regions have specific place-based advantages that may be ignored by more spatially blind international agreements. They need to ensure the wider passive trade framework they work within is set to their advantage and coordinated with their more active regional policy. To make this case, regional leaders need:

1. To be able to cooperate with other regions addressing coordination failure problems that jeopardise many bottom up policies, making it necessary for the national government to act as a facilitator (like for example in the case of inter-regional infrastructure)
2. To develop competencies and administrative capabilities to elaborate a consistent strategy reflecting the genuine demands of local actors. This capacity is often lacking in less developed regions, generating a potential vicious circle
3. To be cognisant of their place (and that of their firms) in GVC. This is where GVC mapping comes in.

5.2. Diagnostic Tool: GVC Mapping & Analysis

144. The typical approach to understanding particular GVCs is mapping and analysis (De Backer and Miroudot, 2013; Frederick, 2016; Gereffi and Fernandez-Stark, 2016). That is, “*For regions to develop a value capture strategy, they first need to diagnose their extant and evolving comparative and competitive advantages. This involves deciding whether to ‘compete’ on their existing strengths or to develop new advantages in new specialisms, as advocated in the smart specialisation framework.*” (Bailey et al, 2018 pg.4) Value chain analysis and mapping is a diagnostic tool for understanding. The method seeks to clarify in which geography and activities the stakeholders involved in the chain engage with. Those who are taking a good or service from its initial stages of production and then onwards to the consumer. The value chain analysis looks to establish dynamic factors such as the governance or inter-firm relationships that influence the product or service. Together they provide the baseline for making informed decisions. Decisions on how GVC actors can build, embed or reshape their actions along the chain – that is understanding both regional and firm heterogeneity.

5.2.1. Upscaling/Upgrading: Driving Non Patenting Innovation

“*Economic upgrading is defined as firms, countries or regions moving to higher value activities in GVCs in order to increase the benefits (e.g. security, profits, value-added, capabilities) from participating in global production*” (Gereffi et al, 2005, pg.171).

145. Regional policy makers have a number of potential upgrading successes that change the traditional approach often narrowly focused on productivity and (technological) product innovation (measured by patents and other strictly technological performance indicators). Within the GVC framework, Humphrey and Schmitz (2002) outline four types

of upgrading with Fernandez Stark et al., (2014) adding three key further additions. They are as follows:

1. Process upgrading – transforming inputs to outputs more efficiently
 2. Product upgrading – moving into more sophisticated product lines
 3. Functional upgrading – increasing the skill content of the activities
 4. Chain or inter-sectoral upgrading – firms moving into new but likely related industries
146. The additions are:
5. Entry into the supply chain – first time participation in a domestic or global value chain
 6. Backward linkages upgrading – local firms (domestic or foreign SMEs) in one industry starting the supply of goods and/or services to a MNE in a foreign country already inserted in a GVC
 7. End market upgrading – moving to more sophisticated markets requiring new more demanding standards.

147. These potential upgrading successes are useful to utilise for regions further away from the technological frontier. It reaffirms the necessity for mapping regional GVCs. This is because upgrading patterns differ based on the input-output structure of the value chain and local context (Gereffi and Fernandez-Stark, 2016). It is important for regional decision makers to understand where their region and its firms are on the chain. Then they can make informed decisions on how to upgrade.

5.2.2. Upgrading: Some Regional Case Studies

148. A case study of GVC Mapping & Analysis useful at the regional level is Torreón, Mexico (see Gereffi, 2005). Initially apparel suppliers in the area were only providing value in the assembly stage of the blue jeans industry there. However, between 1993 and 2000 through upgrading activities they were able to work in higher added segments. Such upgrading was two fold. Product upgrading – providing new distinct washes and finishes. Also, inter-sectoral upgrading – developing expertise in distribution. They were embedding themselves in the value chain.

149. In 2004 facing US export demand shift to China Torreón was forced to further reinvent itself and climb the value chain. This time it had to move from a region predominantly providing a tangible material inputs, instead to pre-production and post-production intangible inputs. This was through the development of local brands and establishment of a local design centre (Gereffi, 2005). Both created new links with other GVCs and were of higher value added.

150. A similar example can be taken from the partner paper from this Seminar Series (see Bianchi and Labory 2018) and the region of Emilia Romagna, Italy. Mapping the knowledge and competencies available allowed the identification of 27 GVCs in five main sectors. The region could then pursue certain activities effectively. Mapping can also be useful to indemnifying regional bottlenecks. This was seen in the tourism service sector, in Antigua, Guatemala. Here, with links analysed these regional tourism stakeholders could facilitate and coordinate industrial policy to overcome the bottlenecks - strengthening the

chain and allow for economic and social upgrading (Oddone and Alarcón 2016, Perez and Oddone 2016).

151. Although not at a spatial regional level, useful mapping has also taken place at the firm level in Costa Rica. Costa Rica Provee (CRP) addressed the market failures associated with information problems (Monge-Gonzalez et al., 2010) by operating a business matchmaking service. A critical first step in dealing with firm heterogeneity was to map SME capabilities. Through focusing on SMEs with greater capabilities and therefore a higher likelihood of becoming successful linkages to MNCs, between 2001 and 2012, the programme created 1,355 linkages between over 400 local companies and over 300 predominantly MNE exporters (Crespi et al., 2014). Assisted firms still see benefits from knowledge transfers resulting from these MNE relationships (Monge-Gonzalez and Rodriguez-Alvarez, 2013). Although an effective matchmaking mechanism (Paus and Gallagher, 2008, Monge-González et al., 2010), over 80% the linkages were not incorporated into MNE final high technology products suggesting in this case, SME firm input unfortunately remained nonspecialised with limited upgrading taking place (de Groot, 2005).

5.3. A Regional Policy: Investment Promotion Agencies & Local Content Units

152. The appreciation of reshaping and promoting GVCs through a welcoming position to FDI and measures intended to promote competitive internationalisation is not a generally accepted view (Stephenson and Pfister 2016). Unfortunately, ambiguity remains on whether participating in GVCs is even a policy worth pursuing, particularly since innovation benefits are sometimes difficult to be derived (Draper and Freytag 2014). As a result, and as outlined prior, an active interventionist industry policy, where governments manage FDI inflows in to areas of their choice is finding favourable response (Stiglitz et al., 2013).

153. One way regional policies can shape GVCs is through influencing the behaviour of MNEs and their foreign investment decisions. A prominent example of these types of policies is the establishment of IPAs – one of the most widespread initiatives to attract FDI (Charlton and Davis, 2007; Harding and Javorcik, 2011; OECD, 2015). IPAs predominantly look at inward investment and are conceptually justified on the basis that transaction costs, imperfect information and information asymmetries are present in capital markets (Greenwald and Stiglitz 1986; Williamson, 1975, 1985). There is a fundamental market failure. Yet, with IPAs we can better match investors and their choices with the regions and their comparative advantages. They can interact with the heterogeneity at the firm level and how this effects the FDI outflow – ensuring opportune regional GVC building. This mitigates the large informational disadvantages that foreign investors experience related to domestic investors (Mariotti and Piscitello, 1995). By attracting FDI, IPAs can help reshape GVCs as firms and their activities enter regions.

154. Not only are they conceptually justified, they are empirically justified. Harding and Javorcik (2011) found evidence from IPAs in 124 countries. It shows, at the national level, that sectors designated as a priority for investment promotion received more than twice as much FDI as non-priority sectors. Currently, investment promotion work and agencies can be grouped into five categories:

1. National image building
2. Investment generation

3. Investor servicing
4. Policy advocacy
5. Investment aftercare

155. The final element is particularly useful to consider. Aftercare looks at the corporate evolution of MNEs, how to reshape the GVC and upgrade through it in the long-term (UNCTAD, 2007; Harding and Javorcik, 2011).

156. If IPAs are given clear objectives in the framework of broader economic development strategies, are well designed and managed, they can represent a cost efficient way of attracting FDI. The IPA, by reducing information costs and cognitive distance, can in principle help build the pre-conditions for the first link with the GVC. They have the ability to play a key role in influencing FDI decisions and reducing entry costs. This is through enhancing their knowledge of local fundamentals (Loewendhal, 2001; Lim, 2008). However, if the existing empirical literature offers some support for IPAs as a tool to build GVCs through FDI, the capacity to embed them into the domestic economy to generate transformation and upgrading remains conditional on the design of complementary measures going beyond investment promotion. In order to avoid ‘cathedrals in the desert’ scenarios – where foreign activities remain isolated from the host economy – three key considerations are of special importance:

1. The action of IPAs cannot stop with the announcement of the investment, aftercare and continued support for the operations of the foreign investor are of paramount importance but often overlooked.
2. Investment attraction should be coupled and coordinated with other tools designed to embed foreign activities into the domestic economy. Foreign firms face higher opportunity-cost in engaging in collaborative innovation projects with domestic firms even when public subsidies are made available.
3. IPAs often target foreign investors with a sectoral logic based on the identification of a set of priority sectors. However, as discussed in Section II, upgrading requires the adoption of a different approach focused on functions and tasks in a GVC logic that is still not common in these organisations.

157. IPAs are also a potential policy tool for lagging regions and indeed Regional IPAs have become increasingly common in both advanced and emerging economies. These sub-national organisations work - with heterogeneous degrees of coordination and complementarity – together with their national counterparts for the attraction of FDI. Recent work has looked at the impact on FDI inflows in European sub-national regions where there is a presence of an IPA targeting certain key sectors and not others (Crescenzi et al., 2018). Derived through an innovative questionnaire based on the work of Harding and Javorcik (2011), it also includes regional IPAs. Preliminary results show targeted sectors saw increases in FDI. Also, national and regional IPAs (where both present) seem to be jointly beneficial to the regional economy in terms of higher investments. This seems to be true in both advanced and less developed EU regions. Therefore, IPAs seem to have an important role to play, particularly to give priority to attracting investors and remove any restrictions to value chain formation (Sutton et al 2016).

158. Regional policy makers should look at implementing IPAs, but only once they have undertaken a GVC mapping exercise. It is critical to identify where the region will build, embed and reshape. FDI flows, both inward and outward if used correctly, can bring positive effects to a policy maker’s region. The promotion of outward investments (also

through OIPAs) is another useful agency. They have successfully assisted domestic and foreign companies investment abroad for years and are ‘natural partners’ to IPAs (UNCTAD 2015, pg.8). This assistance can take the shape in a variety of forms, from the analyses of country and product trends to technical assistance, support and co-financing to take advantage of such trends. OPAs fit nicely with the academic literature showing the knowledge benefits to the home region of firms offshoring abroad. Although we know less empirically, these institutions which carry out programmes to promote and service investment abroad can be useful to the regional policy maker. The private sector has a role to play in collaborating with these agencies to carry out joint promotional activities. (Jordana et al., 2010). Together, they can bring back those sources of knowledge via their network connections (UNCTAD 2015).

5.3.1. Local Content/Linkage Units & Enterprise Mapping

159. While the IPA may bring in general FDI, local content units (LCU) are different. LCUs are bodies set up within investment promotion departments than enable new connections between investors (FDI) and suppliers (SME/MNE local linkages). It can be viewed as a matchmaking service (Steenbergen and Sutton, 2017). They can interact with the heterogeneity at the regional level and how this effects the FDI outflow – ensuring opportune regional GVC embedding. It is the LCU that can piggy back on MNEs and try to get local companies integrated into their supply chains (Sutton, 2016).

160. To best harness the benefits of FDI, attention should be placed on enhancing the potential for spillovers. This is particularly through backward linkages (Sutton et al., 2016). The FDI spillovers evidence shows the main benefits flow through the vertical linkages of MNEs. This evidence encourages the creation of LCUs. The LCU can allow dialogue and engagement with the MNE to arrive at the best local firm involvement in the value chain. Often working better than local content legislation, LCUs form a relationship building approach. Actively engaging with MNEs is a tried and trusted international formula for using local companies in the value chain (Sutton et al., 2016). At a regional level LCUs are less prevalent, however, at a national level, success has been seen. Specific examples at a national level can be highlighted by both Ireland and Singapore. The Irish National Linkages Programme had two key components. One working to account for firm heterogeneity and the other SME upgrading. Through targeting both MNEs and local firms the programme both found links and helped build capacity. This targeting process also looked at SMEs and their ability to improve or upgrade their capabilities (Crespi et al., 2014). The successful programme has now evolved into a wider initiative working at incorporating Irish companies into GVCs. Singapore utilised a Local Industry Upgrading Programme. Here upgrading occurred through training of local firms, but perhaps uniquely this responsibility fell to the MNE. The MNE would second an employee to the local SME allowing direct knowledge transfer and in return, the Upgrading Programme paid the employee’s salary – a leasing of staff. Both these examples focus on capacity and upgrading, therefore can be useful to both technological frontier and lagging regions. In conjunction with private firm linkages, public academic linkages driven by local linkage units can be of benefit. Embedding MNEs in local University structures should lead to further knowledge transfer. The incorporation of cutting edge thinking, University start ups and accelerators should see two way benefits, at MNE and regional level.

161. Combined with enterprise mapping, OIPAs are therefore a useful policy tool to tie in with IIPAs. Enterprise mapping aims to provide a detailed profile of both the industries and leading companies in the area of economic study. Again, the removal of cognitive

distance and restrictions can lead to value chain formation (See Sutton et al., various 2014 publications for further insight).

162. IPAs and the process of GVC upgrading work well together. Through concentrating in sectors where their areas of influence have comparative advantage, sectors can allow diversification, bringing advanced technologies and skills to their host economies (Alfaro and Charlton, 2007). When thinking about IPAs (IIPAs and OIPAs), there is a trade off between more intensive coordinated specialised support and less specialised centralised easier to implement organisations (ECLAC, 2008). However, it is clear that targeting is necessary, allowing messages to be tailored and focused. Emphasising efforts to a particular audience can help deal with both locational and firm heterogeneity, increasing effectiveness (Loewendahl, 2001; Proksch, 2004; Harding and Javorcik, 2011). This targeting must go past exclusively matchmaking. As was seen in Costa Rica, supplementary support is necessary to upgrade these targeted linkages into higher value-added goods and services (Crespi et al., 2014). OIPAs should focus more on external knowledge streams while IIPAs should focus more on enhancing internal tasks. Reshaping GVCs is therefore as much as about the correct mapping and promotion as it is the characteristics of the local innovation and support system (Morrison et al., 2008; Pietrobelli and Rabellotti, 2011). Regional policy makers therefore have a number of tools at their disposal to reshape GVCs in their areas. It is those tools that allow firm and locational heterogeneity to be accounted for which stand the most chance of success. It is critical these tools are coordinated between one another. Trade frameworks that do not correlate with IPAs and therefore stifle them bring limited benefit to the region. These trade frameworks are the policy networks regions must work within. Therefore alignment is key between global policy negotiations and regional delivery.

5.4. Heterogenous Approaches of Reshaping & Their Evolution

163. Many of these active vertical policies outlined are for GVCs of today. However as new value chains are created through new technologies, horizontal policies to be ready for change are also necessary. Regions need the institutional capacity and foresight to connect. Emphasis on tools for re-skilling help set the ground for reshaping the GVCs of tomorrow. Life long learning mechanisms such a competence centres or centres of excellence help ensure regional skills are ready to cope with, and work within new GVCs. As Industry 4.0 brings new value capture opportunities, regional decision makers must think about futureproofing their reshaping. They cannot promote or link with the unknown. Partnering with firms to help ensure re-skilling is relevant will help anticipate this future risk. New technologies also have potentiaal to destroy GVCs – connectivity creates vulnerability to both highs and lows. This integrated nature of GVCs means when crisis strikes it reverberates sharply down the chain. The potential for future technological turbulence further emphasises the necessity to view GVC engagement both through vertical engagement and horizontal readiness.

6. Our Known Unknowns: Gaps in Understanding

Box 4. Key Messages for Policy Makers – Our Known Unknowns

1. Our knowledge base is currently incomplete and therefore there is an inability to fully utilise GVCs for regional benefit.
2. Efforts should be made to resolve key conceptual, data and policy gaps. Particularly when it may just be the matter of replicating what is being done elsewhere e.g. collection Firm Level VAT Data in Japan & Belgium.
3. Progress is happening! More resources such as TiVA Database and ICIO Tables are becoming available to not just enhance our understanding of GVCs, but also how best to engage with them fruitfully.

164. This section aims to briefly outline some key knowledge gaps to be filled before GVCs can be fully operationalised in the framework of a new generation of (regional) innovation policies. The analysis of the existing literature and the exploration of ongoing frontier research in this area has highlighted some key gaps in the understanding of GVCs, their associated actors and the link with the region. This body of work would benefit from future research and analysis in order to inform an evidence-based policy debate.

6.1. Conceptual Gaps

165. Due to numerous writings on GVCs, the literature has been taken in many different directions and there is now inconsistent analysis using different terminology – muddying the waters Stephenson and Pfister (2016). One particular area is the interchangeability between regions as a subnational unit and regions as multi-national unit. The influence of Free Trade Agreements (FTAs) and Rules of Origin (RoO) are important with regard to GVCs. FTAs and RoO are discussed at the supra-national regional level of NAFTA or the ‘regional triad’. However, the regional subnational unit is important when thinking about building, embedding & reshaping GVCs. A united approach on these key terms would benefit both sides.

166. Furthermore, this paper has focused particularly on actions available to regional policy makers or those in regional leadership positions. That is in part due to the fact that regional institutions conceptually still require further elaboration in order to clearly understand what types of national and regional institutional arrangements matter to support regional upgrading.

167. The discussion focusing on building, embedding and reshaping GVCs has largely assumed a value chain in place. With new technologies both creating entirely new value chains, dismantling old ones and reemerging ‘phoenix’ value chains further conceptualisation on what this means for regions is critical.

6.2. Data Gaps

168. The ability to adequately measure GVCs is integral for generating insights and informed thinking. There are empirical gaps related to the GVC that would benefit from

coordinated data collection efforts. With this new information, better informed policies surrounding what works in innovation policy surrounding GVCs and regions would be possible.

169. A useful metric in comparing GVC participation between countries is the GVC Participation Index. Considering the emphasis this paper has placed on the region as a useful unit for GVC discussion, quantitative tools such as a GVC Participation Index at a regional level would be beneficial.

170. Another key area for focus is data availability at the firm level. Only Japan or Belgium collect VAT records at firm level, so it is only these countries where inter-firm trade can be understood in greater detail. To better answer these questions in future, OECD countries and regions need to follow their example.

171. Although advocated, there are still data gaps on OIPAs, task driven IPAs and LCUs. When they work and when they don't. Further data on successful schemes at both a regional and national level would be of use. Further to this, as previously highlighted, within GVCs, trade and investment are more complexly intertwined. Currently the evidence base cannot provide enough detail to analyse this nexus. This led this paper's focus down the more discernible FDI route for clearer policy implications. Once some of the data gaps are rectified, much greater understanding on both trade & FDI will be available.

6.3. Empirical Gaps & Policy Difficulties

172. The aforementioned regional institutions is also an empirical gap in understanding. There is currently limited understanding if institutions can in practice be changed through public policies in a medium-run perspective, and if so, which types of institutions can be influenced by means of what types of practical tools. Due to the difficulty in conceptualisation, how regional institutions can change and how this change can result in reshaping the GVC requires both further thought and empirical analysis.

173. Key policy issues stem from this empirical gap. There is difficulty in getting counter-factual analysis on what works in order to leverage GVCs for regional development and innovation. Not only is there heterogeneity between firms but also heterogeneity between regions. Empirically showing whether success or failure would have happened in absence of the GVC link in light of this is difficult. The empirical literature is also largely undeveloped on the causal relationship between regional institutions and their role in GVCs. In addition, empirical work based on solid counterfactual methods is also missing on how regions can in practice connect and embed GVCs by means of public policies. Here a parallel can be drawn to cluster policy where successful clusters can be identified, yet leveraging lessons from these 'winners' for wider implications is often difficult.

174. Useful tools are becoming more widely available for help in reducing these policy gaps. The following two databases are useful for regional policy makers to engage with and find further information.

6.4. OECD & World Bank TiVA Database

175. The OECD Trade in Value Added initiative addresses the issue of ill capture of global production in conventional measures of international trade. It does so by considering the value added by each country in the production of goods and services consumed globally. The OECD TiVA database also includes indicators that are designed to better

inform policy makers. The new insights in relations between commerce and nations are provided. Useful next steps will be to implement this at the regional level.

6.5. ICIO Tables

176. The Inter-Country Input Output tables are another useful tool, representing domestic transaction flows of intermediate goods and services across countries and inter-country flows of intermediates via exports and imports. Described as ‘one of the most useful tools for studying international production networks’ (Meng and Yamano, 2017 pg.1), the detailed information can be useful for both economic and environmental analysis (Miller and Blair, 2009; Murray and Wood, 2010). They are particularly useful for empirically painting the GVC picture (see WTO-IDE, 2011; OECD-WTO, 2013; OECD-WTO-World Bank Group, 2014; Koopman et al., 2014; and Meng et al., 2015).

177. The development of input output tables allowed the development of the new paradigm. These empirics allowed Grossman and Rossi-Hansberg (2006) to underpin the conceptualisation of the production process in terms of component tasks with data.

6.6. Digitisation of Value Chains

178. New mobile technologies are allowing the greater understanding of value chains at a geospatial level. An example of this is SourceTrace Systems, an application operating in the last mile of the agricultural value chain. The digitisation of the GVC provides more visibility at its ‘touch points’. This clear transparent integration in the GVC is hoped to bring about improvements not just to productivity, but also upgrading these touch points (Maraju, 2014).

6.7. What Has Worked?

179. Work that recognises the heterogeneity at both firm level and locational level is useful for decision makers to draw contextual lessons from. This area of study is important for regional policies. Beginning to remedy the above conceptual and data gaps will allow better informed decisions in the area of what works for innovation policy regarding GVCs at the regional level.

6.8. Key Areas of Future Research

180. There are a number of areas worth highlighting that would benefit from further thought and research on the link between innovation, innovation policies and GVC in a regional context.

181. One such area is intra-firm trade and how knowledge transfers in this setting. Particularly who owns and/or controls these knowledge transfers. Further understanding on how the ‘dominant’ player, i.e. lead firm, can interact with their larger or smaller suppliers.

182. Limited research has also been undertaken on how the effect of future technologies will take hold on a spatial level and the implications they will have on GVCs. Both the positive potential outcomes from GVC upgrading and negative potential outcomes from job loss have been touched upon by this paper, however more empirical thought on this area would stimulate the debate. Also, critical to understand is the role artificial intelligence and automation will have on the diffusion of knowledge. There are potential implications on the labour market effects of the knowledge transfer, yet there is also a possibility

highlighted that these technologies will be able to learn and imitate others in new ways changing the nature of GVCs as well as their geographical footprint.

183. This paper has highlighted a number of approaches available to regional policy makers to help build, embed and reshape GVCs. There are still gaps still needing to be filled, however progress is being made and more resources are becoming available to enhance our understanding of GVCs. The focus on FDI was driven by this limitation. Tangible evidence was best available on the supplier driven chains through MNE governance and equity links. In its construction, this paper has hopefully helped frame GVCs and innovation consequences for regions. Regional decision makers are better resourced to take action on *“not only a matter of whether to participate in the global economy, but how to do so gainfully.”* (Gereffi and Fernandez-Stark 2016 pg.6).

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