

Chapter 2

Scale, Distance, and Remoteness in Global Value Chains

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Abstract⁵

This paper explores how country size and geographical distance to trading partners mediate global value-chain (GVC) participation and upgrading potential. It develops an index of GVC participation to estimate the effects of size and remoteness on GVC participation, as measured by export performance in several goods-producing industries that have been important in the rise of GVCs (electronics, automotives, and apparel, footwear and textiles). Invariably, geographical distance exerts a strong influence on GVC participation, due in part to the costs of co-ordination and a reduction in the exchange of tacit knowledge arising from interactions between buyers and sellers; distance can, therefore, reduce the potential for ‘learning by exporting’. Although small states may find it easier to insert themselves into GVCs through specialisation in a narrow range of tasks, some of the challenges of distance are not easily overcome. Nevertheless, the econometric results presented in this chapter show how enhancing connectivity increases GVC participation. This aspect of participation is of particular importance, as connectivity can transform not only conventional business models but also how buyers and sellers interact. Strong interventions are required to foster exposure to high-value activity hubs that specialise in research and development and marketing, with targeted skill

development and active linkage development, particularly for small remote economies.

2.1 Introduction

The rise of global value chains (GVCs) has been offered up as the perfect example of technology overcoming geography. Containerisation has slashed transport costs, and information and communications technology (ICT) is facilitating the fragmentation and segmentation of work and its co-ordination and monitoring at a distance (Dicken 2010). Vertical specialisation within GVCs suggests that for some countries, comparative advantage can be won in extremely specialised niches in GVCs. Thus, new trade opportunities are arising through the overcoming of a variety of barriers to network entry: minimum-scale economies in production, small market size and underdeveloped national systems of innovation.

One view suggests that, with fragmentation, peripheral locations have new trade opportunities that may enable them to more easily integrate with global hubs of economic activity – ‘Factory USA’, ‘Factory Europe’ and ‘Factory Asia’ – because they can specialise in trade in very narrow product classes and tasks (Lanz *et al.* 2011). They can focus on the export of intermediate goods and services, earning the benefits of trade without

waiting for design capabilities or demanding domestic consumers to emerge (Gereffi and Sturgeon 2013). Participation in GVCs can open conduits for technological learning, process improvements and product upgrading (Humphrey and Schmitz 2002; Pietrobelli and Rabellotti 2011; World Bank 2015). For evidence we need only look to the integration of countries such as the People's Republic of China (PRC), Mexico, the Philippines and Turkey into production networks driven by 'lead' firms based in Europe and the USA (Baldwin 2013).

While we see this view as having merit, it is overly simplified. We agree that GVCs can provide avenues for rapid industrial upgrading and offer opportunities for economic development strategies that extend beyond openness, institutional reform and trade facilitation. However, there are also obvious and significant barriers to upgrading in GVCs, the most important of which stem from the geographical separation of high value-added business functions, such as design and marketing, from routine functions such as manufacturing and call centre-based customer service. Given this, upgrading may be rapid at first but stall in the long run.

Even for countries that are advantaged in regard to size and location, the benefits of GVC participation are far from automatic. As a result of widespread realisation of this, the focus of GVC-oriented industrial policy has shifted to examine questions of how to foster indigenous innovation that leverages the capabilities and knowledge-intensive intermediate inputs resident in the global supply base (Gereffi and Sturgeon 2013). In this chapter, we explore the relationship between size and distance and GVC participation – as well as changes over time – through the concept of 'remoteness', an enriched concept of distance that includes factors such as the quality of logistics, common languages and broadband internet penetration.

This last indicator is of particular importance, as it can transform not only conventional business models but also how buyers and sellers interact.

2.2 Global value chains and economic development

Firm-level efforts to learn and benefit from and upgrade as a result of participation in GVCs may not be effective (Morrison *et al.* 2008), and national innovation systems, including certifications and standards, metrology, testing and quality (SMTQ) systems, may not be sufficient to meet the requirements of foreign buyers or multinational corporation (MNC) affiliates (Pietrobelli and Rabellotti 2011). Since GVCs fragment production systems spatially across vertical business functions, assemblers and suppliers of intermediate inputs may never be exposed to higher value-added functions such as research and development (R&D) and marketing, becoming stuck in subservient roles. Furthermore, even when nationally embedded capabilities are high, openness and trade facilitation cannot overcome all obstacles. This realisation is beginning to stimulate new efforts to foster increased firm-level networking and new forms of private-sector development by governments.

For some countries, the main obstacles to joining and benefiting from GVCs are the same as those that constrain trade more generally, such as: high duties and tariffs, poor trade infrastructure and weak enforcement of business contracts. When these obstacles are removed, the thinking goes, countries can participate in the global economy according to their merits, even when vertical specialisation is optimally narrowed to the point of 'trade in tasks' (WTO and IDE-JETRO 2011). However, research has shown that GVCs are multifaceted and have different characteristics and dynamics, and therefore offer different opportunities for economic development, technological learning and industrial upgrading.

There are different types of GVCs, which vary according to end markets (Berger *et al.* 2005), the technical features of transactions (Gereffi *et al.* 2005), the capabilities in industry-specific and geographically specific supply bases (Ponte and Sturgeon 2014), and the norms of business systems in the home countries of lead firms (Fujimoto 2007). Perhaps most importantly, GVCs vary according to prevailing industries and value-chain segment (Sturgeon and Memedovic 2010). This is, in part, because ‘technology – the engineering of the product – dictates the way in which different stages of production fit together’ (Venables and Baldwin 2011).

While these differences are governed by sets of criteria that are often too technical, complex and dynamic for policy-makers to grasp and develop appropriate policy responses to⁶, this specificity nevertheless opens up a vast field for industrial and innovation policy that is only beginning to be tapped. If there is no single path for upgrading via GVCs, then multiple paths must be considered based on the available evidence. Because most economic statistics are country based, researchers and policy-makers must be creative and innovative in generating information relevant for the policy-making process. Given this, we try to isolate the effects of basic structural characteristics such as size and distance, to provide a starting point for more nuanced policy-making regarding small and remote economies’ GVC participation. Before embarking on that exercise, however, we consider briefly the literature on the effects of size and distance on economic development.

2.3 Size and distance: their importance in economic development, trade and global value chains

Small states face clear disadvantages when engaging with the global marketplace because of their economic size. Of the 49

least developed countries (LDCs), 39 are small (Guillaumont 2007). Small states tend to have higher business costs as a result of a combination of diseconomies of (small) scale and high transaction costs (Winters and Martins 2004). Moreover, many small states have been found to be more vulnerable to economic shocks and less resilient once they occur, because they are unable to rely on intra-state transfers to cushion blows from disasters that affect one region of a larger country and not others (Alesina *et al.* 2005).

The new trade opportunities that have begun to arise as a result of the global fragmentation of production, as manifested in GVCs, holds promise for small states because they accommodate specialisation in narrow business functions, obviating the need for a small country to develop all aspects of an industry. By combining specialisation with global market access, GVCs help small countries link to demanding external buyers and exploit otherwise unachievable economies of scale. Small labour markets can be connected with complementary external capabilities and small markets with larger export markets. As Figure 2.1 indicates, small countries have relatively high levels of GVC participation (right), but the relationship is weaker than for trade overall (left).

However, some activities within value chains, particularly high-volume assembly of standardised products, require substantial scale to achieve cost competitiveness. Others require access to deep labour pools, often with highly specific knowledge and expertise. Moreover, the modes of integration common in GVCs tend to come with requirements for tight co-ordination and control, and these requirements are affected by both trade infrastructure and distance to trading partners. Market size drives the location of production in many instances, giving large countries an advantage when instituting laws regarding investment attraction (including free trade zones), local content and

joint venture requirements, R&D spending schemes and so on.

It is also possible that fragmentation in GVCs can harm small states, depending on the process of GVC engagement. For example, successful start-ups from small remote states tend to be acquired by larger multinationals, with core capabilities subsequently shifted to locations in the hub country to reduce transaction costs. While this dynamic may benefit the immediate entrepreneurs, it is detrimental to the accumulation of scale, agglomeration economies (i.e. clusters), productivity gains and broader-based industrial capabilities in the small remote state.

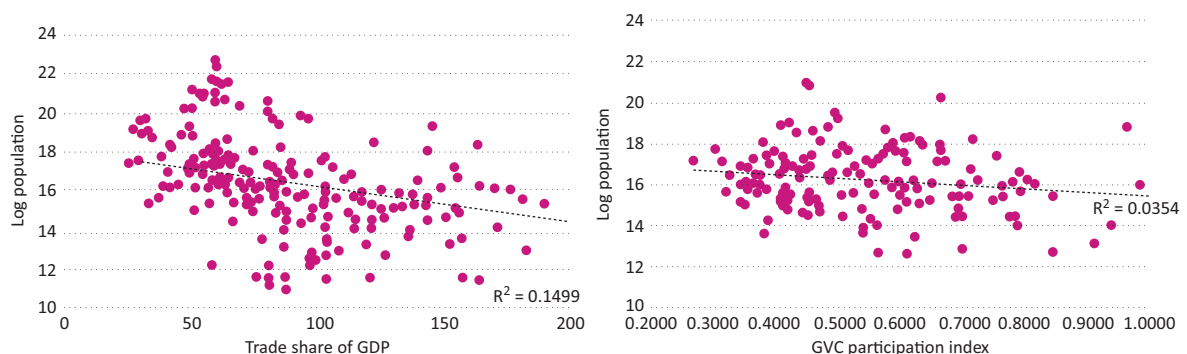
2.4 Does distance matter?

Challenges increase when small size is combined with large distances to markets. While it may help if countries located far from markets are part of larger political or regulatory arrangements, these cannot fully compensate for the absence of the deeper political and cultural affinities that come with proximity and regional integration. Distance slows transport and raises transport costs for people, goods and communication. This isolation decreases the likelihood that a state can

perform a specialised, high value-added role; these tend to be performed in a contiguous regional economy, which is more likely to have regulatory integration and the relatively easy and timely flow of people, goods and capital. Indeed, the importance of distance explains why most production networks are regional rather than global, structured around a discrete regional 'core' (Dicken 2010).⁷ Figure 2.2 (which plots GVC participation against an enhanced index of remoteness⁸) suggests that global proximity is hugely important for GVC participation – more so than for country size.

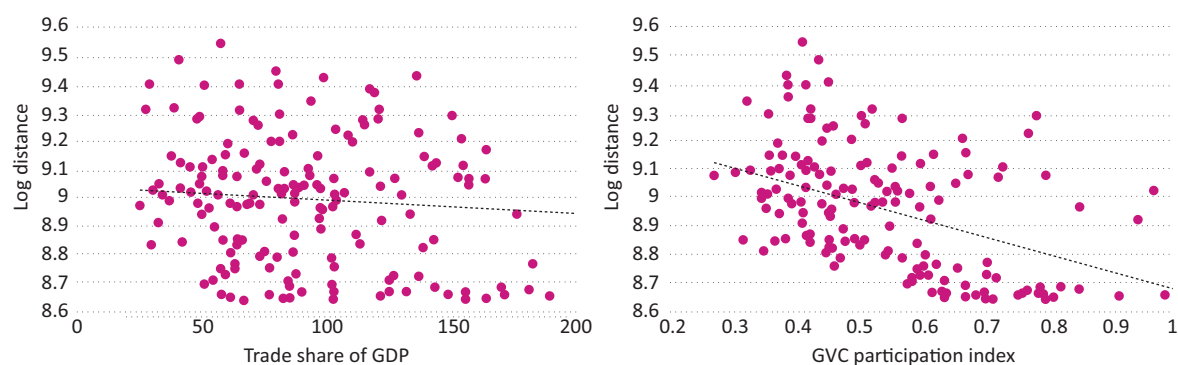
In brief, distance has two major influences on how countries connect to GVCs. First, it impacts the cost and time required to get goods to their next stage of production and to receive inputs from their previous stage. Most obviously, distance matters because trade costs matter. The disadvantages of small states (small shipment sizes and inadequate trade infrastructure) are amplified for remote states because of the higher transport costs and the many other disadvantages that come with long transit times for goods (exposure to humidity and high temperature, in-transit obsolescence, price changes, etc.). Less obvious, perhaps, is the time aspect of logistics, which has become increasingly important within GVCs as the

Figure 2.1 Relationship between country size and overall trade (left) and GVC participation (right)



Source: Population and trade as a proportion of GDP from WDI; GVC Participation Index calculated by authors based on data from the United Nations Conference on Trade and Development (UNCTAD)-Eora GVC database, which includes trade in value added from services.

Figure 2.2 Relationship between distance from markets and overall trade (left) and GVC participation (right)



Source: Authors' calculations based on data from Centre d'Études Prospectives et d'Informations Internationales (CEPII) and the UNCTAD-Eora database.

'just-in-time' practices of 'lean production' and 'fast supply chains' spread into more industries. Thus, while geographically peripheral locations may not be entirely shut out of large-scale production of standardised goods, they are very likely to face challenges in a growing category of products: lower-volume, higher-mix, higher-value goods that require substantial delivery flexibility and timeliness.

Second, distance reduces the efficiency of co-ordination and collaboration because it creates barriers to the direct, face-to-face exchange of tacit knowledge. The reduced likelihood of these interactions has the most disadvantageous effect on higher value-added activities in the value chain, such as design and advanced services. While not as sensitive to transport costs, many types of trade in services also benefit from proximity. This is the case in particular for complex, non-standard services where contact with consumers and between buyers and suppliers in the value-chain benefits from face-to-face interaction to exchange tacit knowledge and uncoded information.

More recently, however, previously unimagined business models⁹ have arisen to leverage and arbitrage globally 'distributed' capabilities, labour markets, regulatory regimes and

markets. Given these developments, there are suggestions that pure distance matters less in contemporary trade within GVCs. This is because within spatially and organisationally fragmented GVCs, high levels of monitoring and control, more precise co-ordination of logistics, and the transfer of highly complex design parameters, requirements and instructions are enabled by the computerisation of design and manufacturing processes, low-cost data communications and improved software to manage the flow of information both within and between enterprises. As a result, distance has become less of a hindrance to segmenting and relocating business functions as the international trading system has become more dynamic, flexible, responsive and complex.

Internet retailing allows individual shoppers and businesses to assess and purchase the wares of sellers the world over. R&D and specialised technical tasks have become subject to arbitrage, as states are being asked to compete with one another for MNC investments in new international technical centres (Sturgeon 2016). Companies can build sophisticated products based on globally available inputs and technology platforms. What we are witnessing in the new 'digital economy' is not a simple fragmentation of existing industrial systems but a basic

transformation of how buyers connect to sellers, how work is accomplished, how production is organised and how distribution is co-ordinated.

2.5 Overcoming distance

The discussion above highlights the fact that while proximity matters most for GVC participation, simple considerations of geographical distance may be becoming less relevant given new forms of engagement arising from new business models. Consequently, a more nuanced consideration of proximity and distance must take into account to a greater extent the ways in which GVCs operate. This includes differentiating between the ‘arms-length’ command and control relationships between lead firms and producers at the lower end of value chains, as well as the relationally dependent exchange of highly differentiated products, requiring flows of complex knowledge. Thus, for GVCs, our understanding of distance needs to expand to cover aspects of agility (flexibility and speed to market) as well as measures that capture the degree to which trading partners have the capacity for complex exchanges. While severe data limitations, especially for trade in services (Low 2016), currently inhibit fully nuanced measures for GVC participation, we have taken an initial step by constructing a measure of remoteness to help explain the determinants of GVC participation with a little more precision.

We did this in a two-step process. First, we tested several factors in an empirical model of the determinants of GVC participation. Based on the results from the model, we then constructed a GVC Remoteness Index (GVC-RI). These two steps are described below.

2.5.1 Step 1: empirical model of the determinants of GVC participation

In this first step, we developed a gravity model for GVC trade, focused on assessing the significance of determinants of participation in trade of GVC products. We identified a set of

factors that we hypothesised were relevant for determining proximity in a GVC context. These factors are described below (details on the variables, their definitions and their sources are available in Annex 2.1).

- **GDP:** this measures the size of an economy; all things being equal, we expect larger economies to have more capacity to engage in GVC trade.
- **Distance:** this is a pure distance indicator, measured as the weighted average geographical distance with the rest of the world; more proximate countries should be more likely to engage in GVC trade with each other.
- **Logistics capabilities:** this is measured by the World Bank’s Logistics Performance Index (LPI). Countries with higher-quality logistics (trade facilitation, customs, physical logistics infrastructure) should be in a better position to participate in GVC trade as a result of lower costs and faster response times.
- **Common language:** this measures trading partners where at least 9 per cent of the population speaks the same language as its other trading partners. Countries that have a common language with trading partners should trade more and be in a position to engage in more complex exchanges of higher value-added activities in GVCs.
- **Time zone:** countries in time zones longitudinally close to trading partners (regardless of east–west distance) are expected to be able to manage operations and therefore GVC trade more effectively (regardless of north–south distance).
- **Broadband access:** this is measured by the number of broadband subscribers per 100 inhabitants, as published by the International Telecommunications Union (ITU). Access to high-quality broadband is increasingly critical for global connectivity and affects the degree to which a firm

communicates with buyers and suppliers in the value chain. While data on trade in services are too poor to include services in our measure of GVC participation, we posit that broadband access is equally important to co-ordinated trade in GVC goods.

To assess how the determinants of goods traded in GVCs differ from those of trade in non-GVC goods, we measured bilateral trade flow using mirror statistics from the UN Comtrade database,¹⁰ following the Harmonised System (HS) classification system at 6 digits of disaggregation (around 5,040 product lines). The sample covered 132 countries from 1996 to 2013, representing more than 95 per cent of world trade flows during that period.

We identified the goods that are usually traded in GVCs by using the classification introduced by Sturgeon and Memedovic (2010), which was further refined and updated for public use by the World Bank in 2016.¹¹ Following this approach, HS codes are identified for being GVC-traded codes, with the remaining codes classified as non-GVC traded. Dummy variables were constructed to estimate total GVC exports and non-GVC exports, intermediate GVC exports and final GVC exports. In addition, using the same classification source, we identified GVC goods within five sectors that were most intensively traded in GVCs: electronics, automotives, and apparel, footwear and textiles. To explore the main determinants for a country's involvement in GVCs, we estimated a gravity model, where the traditional set-up was modified to include modern notions of proximity (remoteness), as described above. The gravity model estimation is based on the following structure:

$$\begin{aligned} GVC\ Exports_{o,d,t} &= \alpha + \beta_1 \log GDP_{o,t} + \beta_2 \log GDP_{d,t} + \beta_5 \log ITU_{o,d,t} \\ &+ \beta_3 \log DIST_{o,d} + \beta_4 \log LANG_{o,d} + \beta_6 \log LPI_{o,d,t} \\ &+ \beta_7 \log TZDIFF_{o,d} + \gamma X_{o,d,t} + \delta_o + \delta_d + \delta_t + u_{o,d,t} \end{aligned}$$

where X is the vector of control variables.

Table 2.1 shows the results using different specifications of the previous equation. In general, the results are robust to different specifications of the model. We included the *ITU* and *LPI* variables in two different ways. First, for each of these variables we included the simple average between the origin and destination country. Second, we included the origin and destination value of *ITU* and *LPI* as explanatory variables.

The results show clear and in most cases significant correlations between the measures considered for remoteness and GVC products. What is striking, in most cases, are the differences in results between products traded in the GVC industries versus those not classified as GVC products. While both GDP (positively) and distance (negatively) show strong, significant associations with exports, the coefficients are markedly higher for GVC exports.

Sharing a common official language with trading partners is significant and positive for GVC products but not for non-GVC products, reinforcing the notion that ease of communication, which may facilitate the exchange of tacit knowledge, is important for co-ordination in GVCs. Similarly, broadband access (of the origin country only¹²) appears to matter for GVC exports but not for non-GVC exports, while logistics performance (also of the origin country only) is strongly positively associated with GVC exports but (perhaps surprisingly) negatively associated with non-GVC exports.

Finally, turning to sectoral results, we find some differences across the GVC industries, often in line with expectations. The automotive industry stands out from the others in being more regionally oriented and, therefore, more reliant on physical distance measures and regional integration, and less on logistics, language and broadband, as expected; apparel and footwear are more reliant on logistics and broadband access; and electronics (with

Table 2.1 Estimation of the gravity model

	Log of non-GVC exports	Log of GVC exports	Log of electronics GVC exports	Log of autos GVC exports	Log of apparel GVC exports	Log of footwear GVC exports	Log of textiles GVC exports
l_gdp	0.02*** (0.01)	0.36*** (0.02)	0.30*** (0.03)	0.11*** (0.03)	0.50*** (0.03)	0.12*** (0.04)	0.26*** (0.04)
Log of distw	-0.07*** (0.02)	-0.65*** (0.06)	-0.62*** (0.06)	-0.59*** (0.08)	-1.14*** (0.07)	-0.90*** (0.09)	-0.81*** (0.08)
1 for common official of primary language	0.03 (0.02)	0.71*** (0.07)	0.68*** (0.08)	0.55*** (0.09)	0.62*** (0.09)	0.53*** (0.11)	0.56*** (0.10)
Log of tz_diff	-0.02 (0.01)	0.22*** (0.04)	0.24*** (0.05)	0.05 (0.06)	0.33*** (0.06)	0.15** (0.07)	0.12* (0.06)
1 for contiguity	-0.11* (0.06)	1.29*** (0.19)	0.92*** (0.21)	1.35*** (0.23)	1.19*** (0.23)	1.11*** (0.25)	1.23*** (0.23)
1 for pair ever in colonial relationship	0.02 (0.05)	0.10 (0.15)	0.32** (0.16)	0.38** (0.18)	0.57*** (0.17)	0.81*** (0.19)	0.32* (0.18)
1 if origin is GATT/ WTO member	0.04* (0.02)	0.07 (0.06)	0.19** (0.08)	-0.02 (0.09)	-0.02 (0.08)	-0.23** (0.10)	-0.14 (0.10)
1 if destination is GATT/WTO member	0.20 (0.13)	0.15 (0.37)	-0.75 (0.49)	0.29 (0.63)	1.69*** (0.57)	2.78*** (1.02)	0.85 (0.76)
1 for regional trade agreement in force	-0.08*** (0.02)	0.63*** (0.07)	0.30*** (0.08)	0.82*** (0.10)	0.85*** (0.09)	0.25** (0.11)	0.69*** (0.10)
Log of total exports	1.03*** (0.00)	0.52*** (0.01)	0.52*** (0.01)	0.57*** (0.01)	0.41*** (0.01)	0.45*** (0.02)	0.49*** (0.02)
Log of itu_o	-0.01 (0.00)	0.06*** (0.01)	0.04*** (0.01)	-0.04*** (0.01)	0.17*** (0.01)	0.18*** (0.02)	0.08*** (0.02)
Log of itu_d	-0.01 (0.01)	0.02 (0.02)	0.07** (0.03)	-0.06* (0.03)	0.04* (0.03)	0.06 (0.04)	0.01 (0.04)
Log of lpi_o	-0.26*** (0.05)	1.85*** (0.13)	2.11*** (0.16)	1.30*** (0.19)	1.94*** (0.16)	2.07*** (0.22)	1.89*** (0.20)
Log of lpi_d	-0.05 (0.07)	0.04 (0.18)	0.10 (0.23)	-0.13 (0.27)	0.12 (0.22)	-0.20 (0.35)	-0.48 (0.30)
Constant	-0.39* (0.23)	-3.86*** (0.65)	-4.05*** (0.78)	0.91 (0.94)	-4.22*** (0.87)	1.84 (1.22)	-3.12*** (1.05)
Observations	18341	18640	16494	13990	15277	10345	12179
R-squared							

Standard errors in parentheses

* p < 0.10, **p < .05, ***p < .01

greater complexity) is most reliant on having a common language and high-quality logistics.

2.5.2 Step 2: constructing the GVC Remoteness Index

Based on the results from the gravity model, we calculated a remoteness index that incorporates the standard notion of scale measured by GDP and geographical distance to all markets, also including the elaborated measure of distance just discussed: broadband capacity, logistics infrastructure and common language.¹³ We called this the GVC Remoteness Index (GVC-RI). It is calculated as follows:

$$GVC\ Remoteness_{i,t} = GDP_{i,t} - DIST_{i,t} + ITU_{i,t} + LANG_{i,t} + LPI_{i,t}$$

where the *GDP*, *ITU* and *LPI* variables are the country-level value of GDP, broadband access and logistical performance. All variables are measured as described above and in the table in Annex 2.1. Since each variable uses a different scale, we standardised them in such way that all have mean equal to 5 and standard deviation equal to 1. A larger GVC-RI score indicates that the country is more remote in terms of scale and the elaborated measure of distance.

The results in Table 2.2 show that the most remote countries in terms of their potential in GVCs in 2015 are Solomon Islands, São Tomé and Príncipe, Haiti, Guinea-Bissau, Comoros and Laos. All of these countries are LDCs. They are all small in population and most are quite distant from large markets. In fact, almost all of the ten most remote countries in the index have populations below 5 million or are islands (many are both).

In comparison, the least remote countries are the USA, the United Kingdom, Canada, France, Switzerland and Germany. This indicates a strong correlation between proximity and level of development. While most of these countries are relatively large in population, this is not exclusively the case. What they do have in

common is proximity to other large markets and high-quality infrastructure. It is clear from Table 2.2 that most proximate countries see relatively little variation in their GVC position over time.

In contrast, the most remote countries show a much greater variability over time and a worse remoteness score than expected based on GDP and location. This underscores the fact that remoteness is not simply a structural issue, but one that can be at least partly determined (or partly overcome) by policy reforms and investments in infrastructure. The country with the best performance in terms of ranking improvement between 2007 and 2015 was Mauritius, which rose 27 places. Despite its small size and remote location, Mauritius experiences strong improvements in both broadband access and logistics infrastructure, which enabled the country to participate in a range of GVCs.

2.6 Concluding remarks

There is little doubt that skills development must be at the top of the agenda for small and remote states. This is because a failure to invest in skills surely confines any country to rely on cost competitiveness to remain in GVCs. Countries that are both small and remote face even bigger challenges to move beyond basic low-value, low-wage value-chain activities. Case examples underline how both distance (raising co-ordination costs and tacit knowledge exchange) and scale (limited depth of local suppliers) make this next step particularly challenging. In this respect, priorities must be to improve the domestic skills base – of workers and managers – as well as leveraging ICT to carve out niche positions in products, tasks and services where transport and co-ordination costs are less binding. Overcoming some of the challenges of distance requires strong interventions designed to foster exposure to R&D and marketing.

Revolutions in ICT offer some hope for small and, especially, remote states to compete in a

Table 2.2 GVC-RI: 20 most remote and most proximate countries

Country	2015		2010		2007		% change in GVC-RI 2007–2015*
	Rank	GVC_RI	Rank	GVC_RI	Rank	GVC_RI	
Solomon Islands	1	0.1218	1	0.1249	1	0.1275	–4.5%
São Tomé and Príncipe	2	0.1068			5	0.0942	13.4%
Haiti	3	0.1009					
Guinea-Bissau	4	0.0979	2	0.1006			
Comoros	5	0.0962	4	0.0974	4	0.0946	1.8%
Laos	6	0.0952	9	0.0911	6	0.0931	2.3%
Fiji Islands	7	0.0934	6	0.0937			
Madagascar	8	0.0933	15	0.0857	11	0.0892	4.6%
Maldives	9	0.0925	5	0.0949			
Bhutan	10	0.0923	7	0.0935			
Mozambique	11	0.0922	3	0.0979	2	0.0958	–3.7%
Bolivia	12	0.0917	12	0.0868	13	0.0871	5.4%
Lesotho	13	0.0910			17	0.0851	6.9%
Tajikistan	14	0.0888	14	0.0858	10	0.0892	–0.4%
Paraguay	15	0.0887	17	0.0850	16	0.0859	3.2%
Burundi	16	0.0885					
Equatorial Guinea	17	0.0872					
Cambodia	18	0.0863	8	0.0931	8	0.0902	–4.3%
Mali	19	0.0856	11	0.0871	18	0.0843	1.5%
Kyrgyzstan	20	0.0851	25	0.0815	22	0.0833	2.3%
Japan	124	0.0523	113	0.0514	105	0.0515	1.6%
Singapore	125	0.0523	115	0.0512	103	0.0521	0.3%
Luxembourg	126	0.0523	111	0.0518	102	0.0538	–2.9%
Austria	127	0.0518	110	0.0522	106	0.0510	1.5%
Norway	128	0.0512	118	0.0490	110	0.0490	4.5%
Spain	129	0.0505	116	0.0500	107	0.0505	0.0%
Denmark	130	0.0504	120	0.0489	112	0.0480	5.0%
Hong Kong	131	0.0499	117	0.0495	109	0.0491	1.7%
Sweden	132	0.0497	119	0.0489	111	0.0481	3.3%
Ireland	133	0.0481	122	0.0472	115	0.0473	1.7%
Netherlands	134	0.0479	125	0.0468	119	0.0461	3.9%
Belgium	135	0.0473	123	0.0471	116	0.0472	0.1%
Korea, Republic of	136	0.0472	124	0.0470	114	0.0474	–0.4%
Israel	137	0.0470	121	0.0474	113	0.0475	–1.0%
Germany	138	0.0470	126	0.0465	117	0.0471	–0.3%
Switzerland	139	0.0464	127	0.0458	120	0.0455	1.9%
France	140	0.0460	128	0.0456	118	0.0464	–0.8%
Canada	141	0.0441	129	0.0434	122	0.0429	2.7%
United Kingdom	142	0.0434	130	0.0432	121	0.0430	0.8%
USA	143	0.0425	131	0.0421	123	0.0419	1.6%

Note: a negative change indicates a lower GVC-RI in 2015 than in 2007, which indicates that a country has reduced remoteness (increased proximity). Not all countries have a GVC-RI calculated for all years, owing to lack of data availability. Overall coverage ranges from 123 in 2007 to 143 in 2015.

‘weightless economy’. Increasingly pervasive, ICT systems have moved beyond their earlier role as labour-saving tools to become core platforms on which work takes place, products are built and services are delivered. They are also increasingly being produced in fragmented GVCs. Taking advantage of such opportunities, however, requires investment in core ICT infrastructure, ensuring that markets for ICT services are competitive, and that ICT skills are extensive and deep.

Notes

- 1 MIT Industrial Performance Center.
- 2 World Bank.
- 3 Inter-American Development Bank.
- 4 University Roma Tre and UNU-MERIT.
- 5 This paper is an edited and shortened version of the more in-depth draft paper received by the authors.
- 6 For example, see Thun and Sturgeon (forthcoming), ‘When global technology meets local standards: reassessing China’s mobile telecom policy in the age of platform innovation’, in Rawski and Brandt (Eds), *The Impact of Industrial Policy and Regulation on Upgrading and Innovation in Chinese Industry*.

Annex 2.1 Variable description and data sources

Variable code	Variable	Description	Source
Dependent variable			
GVC Export	GVC exports	This variable represents the total bilateral exports of GVC goods (expressed in 2005 US\$)	UN Comtrade
Independent variables			
GDP	Gross domestic product	GDP for origin and destination countries (expressed in 2005 US\$)	WDI
DIST	Geographical distance	Average distance between the most populated cities in origin and destination countries. The variable is expressed in km	CEPII
LANG	Language	Dummy variable: 1 if a language is spoken by at least 9% of the population in both countries	CEPII
ITU	Broadband access	Number of broadband subscriptions per 100 inhabitants in both countries	WDI
LPI	Logistics Performance Index	This variable ranges from 1 to 5 and reflects perceptions of a country’s logistics, based on statistics such as efficiency of customs clearance process, quality of trade- and transport-related infrastructure, ease of arranging competitively priced shipments, quality of logistics services, ability to track and trace consignments, and frequency with which shipments reach the consignee within the scheduled time (expressed in 2005 US\$)	WDI
TZDIFF	Time zone difference	Minimum time zone difference between countries (expressed in hours)	Authors’ calculations
Control variable			
TOTEXP	Total exports	This variable represents the total bilateral exports of goods (expressed in 2005 US\$)	UN Comtrade
CONTIG	Contiguity	Dummy variable: 1 for countries with common borders	CEPII
COLONY	Colony	Dummy variable: 1 for pair ever in colonial relationship	CEPII
GATT	GATT (General Agreement on Tariffs and Trade)	Dummy variable: 1 if the country is GATT/WTO member	CEPII
RTA	Regional trade agreement	Dummy variable: 1 for regional trade agreement in force	CEPII

- 7 As Venables and Baldwin (2011) put it, 'The cost and unpredictable delays involved in intercontinental shipping and travel of technicians and managers still matter, particularly with just-in-time management techniques.'
- 8 This index is constructed as follows: GDP-weighted bilateral distance (60%); GDP-weighted bilateral Logistics Performance Index score (20%); GDP-weighted bilateral trading partners sharing a common official language (20%). Source: CEPII.
- 9 For example, Uber and AirBnB.
- 10 In order to minimise inconsistencies in trade data, an approach known as 'export mirror data' was used, whereby import flows are used to calculate export flows. In this approach, country A's export flows are calculated by compiling all the import records from the other 131 countries in the sample to country A.
- 11 See: <http://wits.worldbank.org/WITS/WITS/AdvanceQuery/GVC/GVCQueryDefinition.aspx?Page=GVCIndicator>
- 12 Results are not significant for the destination country.
- 13 Based on the results from the gravity model, we have decided not to include time zone distance in the index.

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