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Fuelling the global value chains: what role for logistics capabilities?

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Abstract: Intensifying competition and changing customer demands for better and cheaper goods and services, and faster delivery have made the organisational systems of Global Value Chains (GVCs) more complex and difficult to manage and coordinate. Leading enterprises in GVCs were forced to focus on their core competences while outsourcing other activities to enterprises that specialise in physical distribution and materials management, in transport and in logistics. Complex system of GVC and networks are dependent on efficient logistics. The benefits arising from GVCs' spreading could not be realised without co-developments in modern logistics services, underpinned by innovations in containerisation, intermodal transport and the application of Information Technology (IT) in physical distribution and materials management. As a result new innovative logistics providers and concepts have emerged, but the development and provision of advanced logistics services vary from country to country.

Countries seeking to benefit from globalisation and from GVCs need to address key underlying factors of their logistics capabilities and how they

impact on their industrial performances, productivity and competitiveness. This paper focuses on logistics capabilities and on how they can be monitored. The paper presents major changes in logistics industry since 1990s and discusses recent work to monitor logistics performances of countries with a composite index. The paper proposes constructing a new index to monitor logistics capabilities and concludes with policy recommendations for developing countries.

Keywords: logistics industry; GVCs and networks; Logistics Performance Index; LPI; Logistics Capability Index; LOCAL; drivers of logistics capabilities; industrial policy.

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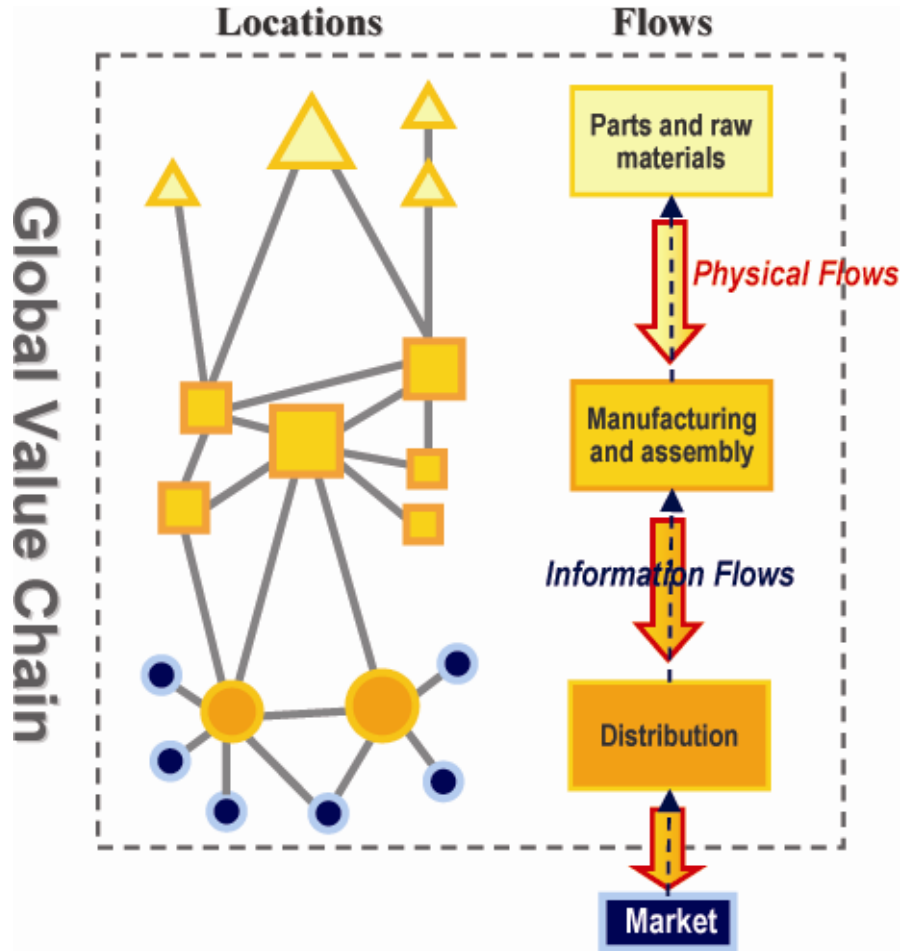
1 Introduction

Complex production systems characterised by the setting of Global Value Chains (GVCs) and networks are dependent on efficient logistics. Logistics supports and shapes the coherence of GVCs and networks (Hesse and Rodrigue, 2004). The benefits arising from GVC could not be realised without co-developments in modern logistics services underpinned by innovations in containerisation, intermodal transport and the application of Information Technology (IT) in physical distribution and materials management.

Logistics commonly refers to organising and coordinating the movements of material inputs, final goods and their distribution. It was first used systematically for military purposes but its use gradually spread to commercial endeavours, often referred as logistics management. The Council of Supply Chain Management (SCM) Professionals defines logistics management as "... that part of supply chain management that plans, implements and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption to meet customers' requirements".¹

In reality, the scope of logistics issues for manufacturing and trading firms go beyond the 'traditional' tasks of physical storage and movement of goods. The concept covering this broader scope is SCM, which entered the business vocabulary during the past 15 years.² Business-related logistics or SCM services include customer service, demand forecasting, documentation flow, inter-firm movements, inventory management, order processing, packaging, parts and service support, production scheduling, purchasing, returned products, salvage scrap disposal, traffic management, warehouse and distribution centre management, and transportation. These services must be planned, coordinated and controlled to maintain the production system.

Rodrigue (2006) argues that in the economic setting of GVC formation, intense global competition and diminishing profit margins, logistics offers opportunities to enhance the efficiency and productivity of production. In many sectors of activity, particularly in supply chains of retail, the application of logistics remains one of the few inputs that can be mitigated to cut costs. Those opportunities come from the core of the modern logistics concept, which is time and space management of the flows between material inputs, design, manufacturing, distribution and consumption. The geographical fragmentation of production and consumption and their functional integration in GVC are based on integrating the principle of flow and principle of locations (Figure 1).

Figure 1 System of flows and locations in GVC (see online version for colours)

Functional integration is reached through supply-demand relationships involving material flows between suppliers of materials, and parts and components, manufacturers and distributors. Efficiencies are reached through a flow principle: demand is synchronised with supply through changes in distribution approach, where coordination between modes and different transport system is required (Ibid.). SCM shifted from inventory-based system, aiming at roughly satisfying demand, to a complex and comprehensive data collection system ensuring replenishment based on demand, ensuring better match between supply and demand. Economies of time demanded integration of material flow and information flow. The physical flows are correlated with significant information flows, such as orders (see Figure 1). More timely and flexible distribution was reached by a higher reliance on trucking and air transport. Low energy prices that prevailed since the 1980s also favoured the strong integration of these modes in SCM practices.

Through Transnational Corporation (TNC) corporate strategies, many locations around the globe are embedded in GVCs by this flow system. The geographical

fragmentation of production and consumptions (including the consumption by firms) is based on mobilising comparative advantages of different geographical locations to reach higher efficiency in producing fragmented value chain tasks. GVCs lean on the integration of a system of locations through a system of flows. This integration is not simply additive one, as both sub-systems can have their own development dynamics, and can have feedback loops among them. It relies on intermodal transportation to support mobility, on skills to manage and coordinate complex network of production arising from the spatial fragmentation in production, distribution and consumption, and on new resources to provide adequate infrastructure to support the physical mobility. This global production system can be self-sustaining if the growth in productivity can provide for the subsequent investments for further innovations in logistics and for covering the costs of value chain management, infrastructure enhancement and maintenance. This process depends on energy prices, on the prospects for further enhancing logistical capabilities in developed and developing countries, and on the macroeconomic fundamentals in the global economy. All these are subject to much volatility, underlining ongoing adjustments in SCM practices to lower risk.

Countries seeking to benefit from globalisation and from GVCs need to address key underlying factors of their logistics capabilities and how they impact on their industrial performances, productivity and competitiveness. This paper focuses on logistics capabilities and on how they can be assessed. It first discusses major changes in logistics since the 1990s. It then proceeds with recent attempts at monitoring logistics performances of countries. A new index to monitor logistics capabilities is then proposed. The paper concludes with policy recommendations for developing countries.

2 Major changes in logistics

The changing geography of global production is triggering changes in global distribution systems (Coe et al., 2004). Global distribution is planned and operated based on the nationally designed networks and through the principles of economies of scale and scope. Preferred locations for building large distribution centres became high throughput gateways and corridors with access to traditional trade gateways and to large consumer markets. As a result, a dichotomy of gateways has emerged in the global economy, showing much of its functional specialisation. On one hand, large-scale export-oriented gateways like Hong Kong, Singapore, Shanghai and Bussan show the new manufacturing dynamics that has taken shape in Pacific Asia. On the other hand, import-oriented gateways, such as Rotterdam and Los Angeles/Long Beach, are mirroring their counterparts. Gateways became the interface between the geographies of production and consumptions (Coe et al., 2004). However, congestions and land constraints limit the expansion of these gateways and as a result inland hubs are emerging. Through favourable locations and agglomeration economies, many have become freight distribution clusters, managing freight flows for several unrelated users benefiting from economies of scale in sharing the same facilities and equipment of transport terminals. This cuts transport costs and contributes to higher reliability.

Although some goods require a three-tier distribution system, with international, national and regional distribution centres, others may rely on one global freight distribution centre. Based on the characteristics of each supply chain logistics, service providers are assessing the advantages and disadvantages of different locations for land

availability, costs, transport access, business environment for round-the-clock operations, and their advantages for connecting local and long-distance flows. This leads to a variety of location strategies.

Staying competitive often implies higher throughput and providing the demanded services at low rates. Shippers, freight forwarders, warehousing firms and terminal operators are trying to accommodate as many tasks in logistics value chain as possible. They create networks and offices in various geographical locations to build global presence. They invest in warehouses, distribution centres, tracks, airplanes, ships, and in complex information systems. But, competition has intensified in the industry, and these leading firms became challenged by vertical and horizontal linkages, by mergers and acquisitions, joint ventures, and by new innovative logistics providers and concepts such as Third and Fourth Party Logistics (3PL and 4PL).³ These logistics concepts mean the supply of all, or many, logistics services by external agents, who are engaged in continuous long-term relationships with their clients (or relational value chains in GVC approach parlance). Many services they offer expanded over time to include not only transport and storage but the entire chain of the value-added tasks, including procurement, warehousing, inventory management, packaging, trucking, customs brokering, e-services, international transport, supply chain consulting and optimisation, and customer services.⁴

The role of logistics providers in GVCs has gradually changed, both in content and in complexity (Ojala et al., 2006). They are becoming value chain coordinators and integrators (Ojala et al., 2006; Rodrigue, 2006). They coordinate and integrate various logistics tasks with manufacturing, marketing, distribution and sales. Some of their distribution centres also perform simple manufacturing tasks, e.g. assembly and packaging, making the distinction between production and distribution blurred. They often possess a wide range of competences and come from various backgrounds, including transportation managers, freight forwarders, intermodal freight handling, warehousing, IT managers, software makers and supply chain managers.

The logistics industry contributes around 14% of global GDP (Rodrigues et al., 2005). Usually logistics costs make up some 10–17% of GDP in industrialised countries. In 2003, in the USA spending on logistics was estimated at US\$936 billion, while spending on 3PL only was around US\$104 billion, or over 11% of this. Similar estimates were given for the European 3PL market. In China the logistics market is also developing rapidly, with spending on logistics estimated at around US\$300 billion in 2003, and on 3PL at US\$12 billion in 2004 (Ojala et al., 2006).

Since the early 1990s, the logistics industry has grown by around 10% per year. The fastest growth rates are in 3PL and 4 PL services, followed by international container shipping and air freight (Ojala and Häkkinen, 2006). So, global logistics markets are developing rapidly and competition in the advanced logistics services is intensifying.⁵ The industry is under continuous pressure to develop new and flexible solutions, apply new management approaches, and to innovate with practical applications of new technologies and new concepts to address more stringent environmental regulations. Recently, the industry is confronted with raising prices of petroleum and a debate shifting to energy security.

Providing advanced logistic services depends on adequate physical infrastructure, in line with technological development, new organisational changes and the requirements for efficient and environmentally friendly transport services. Inland infrastructure should match maritime infrastructure; roads need to be suitable for container transport; ports

need to be able to handle containers; just-in-time inventory and physical movements of goods require timely exchange of information helped by up-to-date information and communication (ICT) infrastructure and technology, and by favourable legal and regulatory conditions. Also, customs and other border agencies need to work efficiently and trans-border transportation need to be better harmonised, particularly in developing countries.

New skills, new organisational and managerial capabilities, fast and efficient ports and customs clearance procedures (i.e. trade facilitation capacity), and a stable and predictable business environment are also fundamental. These drivers of logistics capabilities are important to leading firms in GVCs, when looking for new suppliers and consumers, or for investing in competitive industrial locations, but they contrast sharply with many developing countries' capabilities. Poor infrastructure, low connectivity with global transport networks, low transport and SCM capabilities, complicated and non-transparent administrative requirements causing long delays in ports and customs are serious obstacles for developing country producers wishing to participate in GVCs and to access markets where they can compete on price. When infrastructure provision is often a simple matter of investment and technical know-how, the regulatory framework is a complex issue linked with politics and national interests.

According to recent studies, there are substantial differences across countries in their logistics capabilities and its drivers that significantly correlate with country (region) differences in trade performances and poverty, implying that substantial growth in trade and in poverty elimination could be reached by improving them in lagging countries and regions.

For developing countries to have a better participation in the global economy in line with their respective resources and comparative advantages, adequate provision of trade infrastructure, investments in market regulations and in training to develop specialised skills and efficient custom procedures are therefore essential. Monitoring and evaluating countries capabilities to provide advanced logistics services competitively and benchmarking their logistics structural factors such as hard infrastructure, quality of logistics services, soft infrastructure like laws and regulations, and trade facilitation are therefore an important step in understanding the challenges logistics and freight distribution pose. This would help underpin decision making at different levels, national and supra national, and would inform various private and public actors on how infrastructures (hard and soft), SCM skills and trade facilitation can be improved to improve cross-border trade.

3 Logistics performances

It is clear that the development and provision of advanced logistics services varies from country to country. In most developing countries, the market for these services is small or even non-existent (Arvis et al., 2007a), which can be a major deterrent for companies wishing to establish a market presence. In such a context, governments at various levels must therefore ensure that regulatory conditions do not unduly restrain and burden the logistics sector.

How challenging individual countries are perceived to be as trade and transport partners can be analysed in several ways. Trade and transport operations involve many partners in the public and the private sector such as banking and insurance agents,

and various logistics service providers. Also, trading partners (buyers and sellers) often evaluate the practicalities on a case-by-case basis. Figure 2 illustrates this by referring to the first worldwide Logistics Performance Index (LPI) reported by Arvis et al. (2007b).

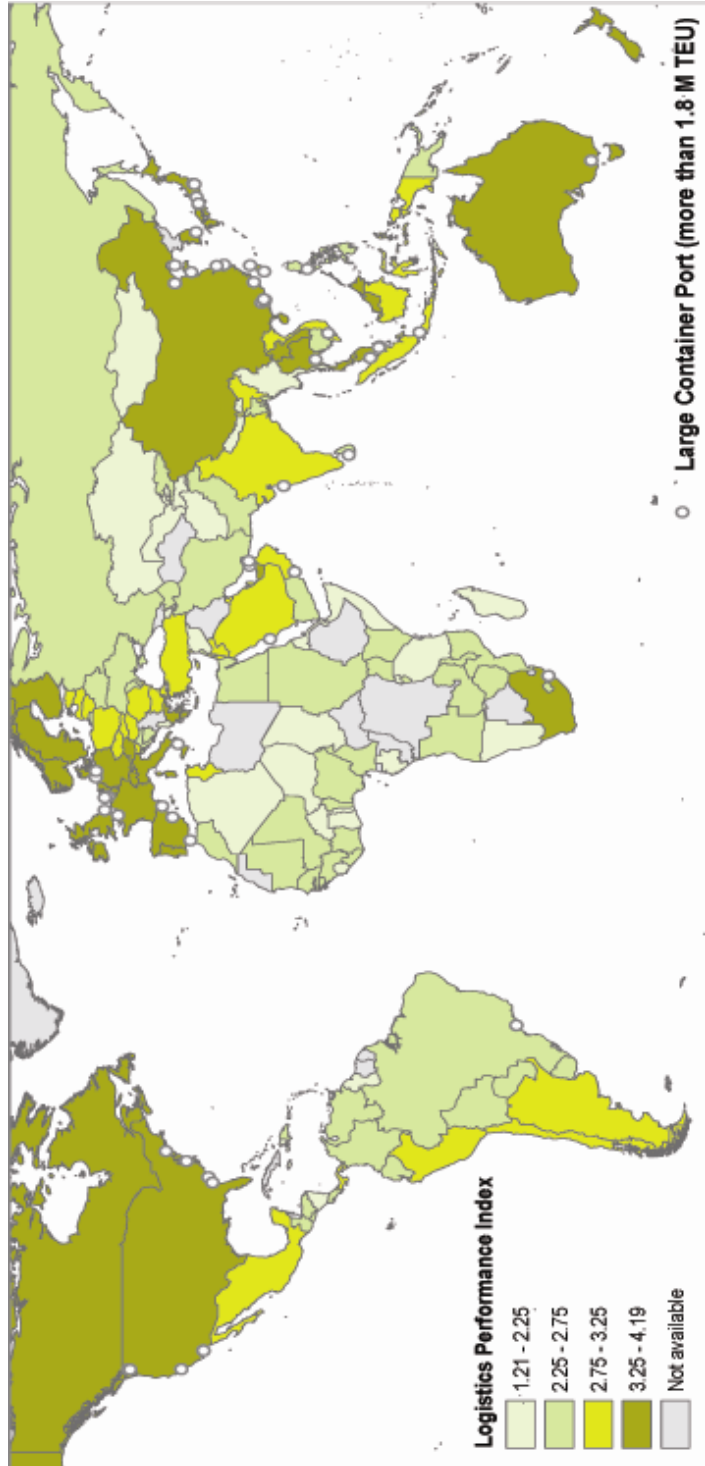
The LPI is a composite index based on proxy measures for transport and information infrastructure, SCM and trade facilitation capabilities, which are calculated based on a world survey of international freight forwarders and express carriers. The LPI is based on seven underlying factors of logistics performance: (1) efficiency of the clearance process by customs and other border agencies; (2) quality of transport and IT infrastructure for logistics; (3) ease and affordability of arranging international shipments; (4) competence of the local logistics industry; (5) ability to track and trace international shipments; (6) domestic logistics costs and (7) timeliness of shipments in reaching destination. The selection of indicators was based on interviews with professionals in international freight logistics. The data was gathered from managerial level personnel of international freight forwarding firms worldwide. The perceptions are therefore representative of the views of a large range of logistics providers and logistics buyers.

The LPI rankings show that building the capacity to connect firms, suppliers and consumers is a key in a world where predictability and reliability are becoming even more important than costs. Figure 2 shows that high-income OECD countries lead in logistics performances. They benefit from economies of scale and scope, innovation and technological change in logistics services. On average, the LPI is a good proxy for involvement of each country in GVCs and there is a significant concordance with the location of the world's largest container ports.

According to the LPI, Singapore, a major global transport and logistic hub, ranks first, in tune with its role as the world's largest container port. At the other extreme are low-income countries, particularly those landlocked in Africa and Central Asia. All developed countries turned out to be top performers – among the seven most industrialised nations, Germany ranks 3rd, Japan 6th, the UK 9th, Canada 10th, the USA 14th, France 18th and Italy 22nd out of a total of 150 countries covered. There are also significant differences among developing countries with similar incomes. China and Chile, for instance, rank 30th and 32nd, respectively, while countries in higher income groups, such as several oil producers, tend to perform below what would be expected from their income levels.

Logistics performances in developing countries vary significantly by group of countries. Those developing countries with higher trade performances performed better than those with similar incomes. Examples include South Africa (24th), Africa's top performer, Malaysia (27th), Chile (32nd) and Turkey (34th), among upper-middle income countries; China (30th) and Thailand (31st) among the lower-middle income countries, and India (39th) and Vietnam (53rd) among the lower income countries.

Figure 2 The logistics performance index (see online version for colours)



Oil-producing countries perform below their potential and their logistics systems usually focus on a handful of bulk export commodities rather than serving diverse trade logistics needs. The exceptions are the United Arab Emirates and Bahrain, which have become important financial centres and global logistics providers, by recycling the substantial oil revenues generated by many countries around the Persian Gulf into new venues. For instance, Dubai Ports World (DPW) has become one of the most prominent global port operators, operating 42 port terminals in 27 countries. Those developing countries with better logistics capabilities tend to have higher Foreign Direct Investment (FDI), lower transaction costs, a diversified export structure and higher growth. In some emerging economies with good export performances, private sector pressure for introducing the institutional reforms and market regulations needed to support efficient logistics operations were important.

Developing countries taking part in GVCs were keen to invest in ports, improve customs procedures and set up linkages with the foreign partners in logistics value chains. Local firms had better connections with foreign partners and markets and thus greater opportunities for technological learning, innovation and development. Some have become leading players in high-end markets. The economic performances of Singapore and Hong Kong SAR are partly a result of their logistics capabilities (Carruthers et al., 2003; Arvis, 2007b). They have upgraded in various value chains by using global and regional logistics capabilities to add value to Chinese products, in order that they can meet the quality requirements of developed country buyers. These intermediaries have moved from simply adding value by controlling the quality of manufacturing, to setting up and controlling retail outlets and developing their own brands.⁶ They have followed the upgrading trajectory of moving from Original Equipment Manufacturing (OEM), to global logistics contracting and to own brand manufacturing (Memedovic, 2005).

Low-income countries, landlocked countries or countries with political instability are at the bottom of the LPI ranking. They have high transport costs, long delivery delays, and heavy dependence on the logistic performances of transit countries.

Most new EU member states, for example, were able to improve their logistics environment in a short time. This has shifted shippers' focus from infrastructure-based obstacles to advanced logistics concepts, though policymakers often remain preoccupied with infrastructure issues. Consistent government action, direct investment by foreign firms and extensive financial support from the EU were the key factors behind the rapid and positive development in these countries (see also Guasch and Kogan, 2001; Naula and Ojala 2002; Ojala, Naula and Queiroz 2004).

4 Drivers of logistics performances

4.1 Hard infrastructure

Unlike ICT infrastructure, which has improved rapidly in most countries, investing in transport infrastructure to meet modern business needs has become a challenge for developed and developing countries. In many cases, capital investments have not kept with traffic growth. For instance, the USA has lost much of its primacy as a world leader in trade-related infrastructure like airports, public transit, roads and bridges. The only major exception is rail, which has seen a resurgence and with double-stacking make up the world's most efficient long distance inland freight transport system. China,

India, Japan and Europe are investing more in their transport systems and in logistics infrastructure. These countries are also applying more innovative approaches to infrastructure funding, construction, operations and management (The Economist, 2007).

The relevance of transport infrastructure for logistics costs is high. Poor transport infrastructure results in high transportation costs (because of higher fuel consumption and maintenance), large inventories and inventory costs, long and uncertain delivery times and congestion in port areas, where in many cases manufacturing is expanding faster than infrastructure capacity.

Several studies have suggested that by lowering logistics costs, the stock and quality of a country's infrastructure can have a significant impact on its productivity, competitiveness, economic growth and poverty elimination. Limao and Venables (2001) estimate that infrastructure quality makes up 40% of the variation in transport costs for coastal countries, and for around 60% for landlocked countries (in Carruthers et al., 2003, p.118). Estimates made by Calderon and Servén (2004b, in Gonzalez et al., 2007, p.15) show that the volume of infrastructure stocks has a significant positive effect on economic growth. Their scenarios underline that if all Latin American countries were to catch up with the region's leader (Costa Rica) in infrastructure stock, their long-term per capita income growth would rise between 1.1 and 4.8% annually; if they caught up with the East Asian median country, income growth would rise by between 3.2 and 6.3% annually. Since these estimates show that infrastructure is linked with a society's income level, and help raise incomes more than proportionately, this suggests that infrastructure development should rank at the top of the economic development agenda.

Investment in transport infrastructure can create positive externalities by stimulating demand for small-scale businesses, by attracting FDI, by decreasing import and export prices and by ensuring better consumer choices. These can translate into higher welfare benefits. Markets that are protected with high transportation costs result in lower competition and higher costs of living. Better materials inputs supply are also associated with productivity growth in manufacturing. Redding and Venables (2002) estimate that more than 70% of the variation in per capita income across countries could be explained by the geography of market and suppliers, while better access to coastal/port areas alone could raise incomes by 20%. These are serious obstacles for national firms wishing to participate more extensively in GVCs. In many developing countries, regional transport costs still explain a substantial share of the cost of delivering products to the market, and are becoming higher barriers to trade than border barriers (World Bank, 2004, p.2.). Measured by time and cost of delivery, producers and consumers in some developing countries are closer to the American and European markets than to neighbouring countries because of the poor land access facilities. Shipping a car from Japan to Ivory Coast (Abidjan) costs US\$1500, while shipping the same car from Abidjan to Addis Ababa (Ethiopia) costs US\$5000 (International Monetary Fund, 2005, p.43). But some export-oriented countries, such as China, have followed such a strategy on purpose. The transport infrastructure investment priority was along the coast, particularly around major gateways, with the aim to propel the export-oriented manufacturing sector and to secure economic development. This phase is mostly finished and substantial new investments are now developing China's inland transport system.

The situation for landlocked countries is worse. Shipping a 20-foot container from Shanghai to Chad's capital N'Djamena takes about ten weeks and costs US\$6500, while shipping the same container to a landlocked country in Western or Central Europe would take about four weeks and would cost less than US\$3000 (Arvis et al., 2007b).

The difference in time and costs is explained by the quality of transportation infrastructure, standardisation in inland shipment, and by the governance and security environment.

Inventory holdings in manufacturing were found to be two to five times higher in developing countries than in the USA because of poor infrastructure. If these inventories were halved, they could cut unit production costs by 20% (Guasch and Kogan (2001, 2006), in the World Bank Study by Carruthers et al. (2003)).

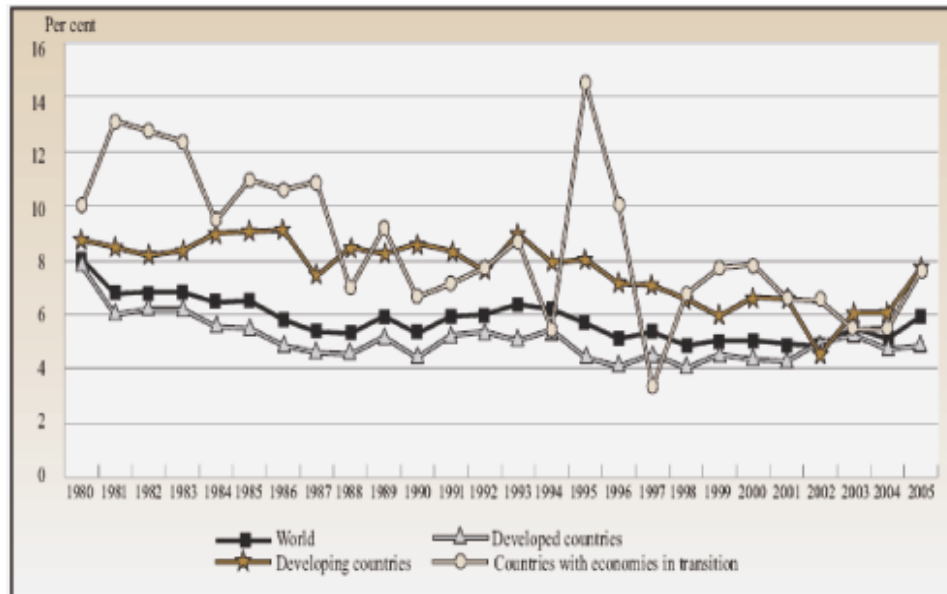
Developed countries had the lowest freight to import value ratio over time (see Table 1 and Figure 3), while countries in Africa and Oceania had the highest. High transport costs diminish the competitiveness of African products and create serious barriers for their producers' participation in GVCs and in the world markets. Asian countries freight to import value ratio has decreased over time.

Table 1 Freight costs as a share of import value, 1990, 2000, 2004 and 2005

<i>Region or country group</i>	<i>1990</i>	<i>2000</i>	<i>2004</i>	<i>2005</i>
World	5.3	5.0	5.1	5.9
Developed countries	4.4	4.3	4.7	4.8
Developing countries	8.6	6.6	6.0	7.7
USA	6.0	5.0	4.4	4.4
Asia	9.2	6.8	5.9	5.9
Africa	10.3	9.6	10.0	9.4
Oceania	10.0	9.5	15.4	9.5

Source: UNCTAD (2007) Review of Maritime Transport 2007, p.80, Table 42

Figure 3 Freight costs as a percentage of value of imports: long-term trend (1980–2005)
(see online version for colours)



Source: UNCTAD secretariat, based on table 42

4.2 Role of transport corridors

The North American and the European economies have for long benefited by the setting of long distance transport corridors linking their inland markets to major trade gateways, namely port cities and also cross-border ports of entry. For landlocked countries in Africa, developing transport corridors to ports in coastal areas is essential because high transport costs make their products less competitive in the world market. Insufficient transport infrastructure constrains intra-regional trade and regional competitiveness, and makes consumers and producers worse off. The World Bank estimates that if the roads were paved, trade between West African countries could expand by up to 400% on average and by 300% in Southern Africa (World Bank, 2007; see also United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), 2003; Chowdury and Erdenebileg, 2006).

4.3 Stable and predictable business environment

Firm-level competitiveness and productivity is highly sensitive to the quality of the logistics environment in which firms operate (Arvis et al, 2007b, p.16.). An unstable and unpredictable business environment often results in higher unit costs induced by higher inventories and by switching to more expensive modes of transport to prevent disruption in the supply chain. For instance, American businesses hold inventories equivalent to around 15% of GDP, while inventories in Latin America and other developing regions are often twice that amount (Guasch and Kogan, 2006, p.9). These induced costs are a more important differentiating factor in determining competitiveness than direct costs (i.e. capital, material inputs, fuel and freight services). In the USA, efficient shipments of intermediary and finished goods have contributed to cutting firms' average inventory levels by one fifth over the last decade, and to a significant improvement in productivity across the economy (Gonzalez et al., 2007, p.16).

Eifert et al. (2005, p.14) pointed out that the costs for transport, logistics, telecommunications, utilities, security and bribes are high and variable in many developing countries. In most African countries, they are between 20 and 30% of a firm's total costs, and between 7 and 12% in China, India, Nicaragua, Bangladesh, Morocco and Senegal. In contrast, in developed countries, these costs are low and fairly invariant. In Zambia, for instance, three-quarters of the net Total Factor Productivity (TFP) gap relative to China can be explained by the excess in indirect costs, while less than a quarter is caused by the gaps in factory floor direct costs (raw materials, skills, technology, etc.) (Eifert et al., 2005, pp.17, 18).

Bowersox et al. (2005) and Ojala et al. (2005) show that the logistics gap between industrialised and developing countries is widening when total logistics costs, including transport, overheads and inventories are considered. In industrialised countries, in the early 1980s, total logistics costs' share of GDP was between 15 and 20%; by year 2000 this had decreased to less than 10% in the USA because of better SCM and cuts in inventory holdings. Comparable figures for Less Developed Countries (LDCs) in early 2000 were over 30%, and for the emerging economies between 15 and 20% (Arvis, 2007a, p.24).

4.4 *Quality of logistics services*

Arvis et al. (2007b) point out that the most important driving factors of logistics performance are reliability of delivery, measured by the predictability of the clearance process, the timely delivery of shipments and the quality of logistics services. Interviews with professionals in international freight logistics show that in countries with high logistics performance there was greater satisfaction with private than with public providers of logistics services, while this was not the case in low performing countries. This is an important insight on the market failure presence for these services in low performing countries. Undeveloped market, the absence of competition and inadequate market regulations often lead to corruption or to poor quality of logistics services.⁷

4.5 *Trade facilitation*

Cumbersome customs procedures, long clearance times for goods at customs, excessive and unnecessary data and documentation requirements, and lack of coordination between customs and certification organisations are also important determining factors of transaction and logistics costs. Longer time requirements for border crossings may cause higher inventory holding and red tape, adding more costs to already high logistics costs in developing countries. These inefficiencies can be greater barriers to trade than tariff barriers.

Rules, procedures and mechanisms that help to simplify and standardise customs procedures and make the information flows associated with the import and export of goods easier (also referred to as trade facilitation) can help cut transit times and red tape, and thus to improve transparency.⁸ Trade facilitation is an important issue for Small- and Medium-sized Enterprises (SMEs) because they are often not equipped to cope with non-standardised customs procedures and intermediaries, and for exporters in landlocked countries because they have to transit several countries to reach their export markets.⁹

Trade facilitation diminishes the discretionary (sometimes arbitrary) power of customs officials and therefore cuts the scope of corruption. It also contributes to security through more effective customs controls and to government revenues, which in some cases make up around 50% of government income. Revenue loss from inefficient border procedures in some developing countries may exceed 5% of GDP.

In a globalised economy, trade facilitation and efficient regulations directly contribute to enhancing linkages of local supply chain with the GVCs. Some studies point out that substantial differences across countries in the quality of trade facilitation, including port infrastructure, e-commerce use, customs clearance and regulatory administrations, are related with the differences in the quality of trade performances.

Wilson et al. (2004) estimate that enhanced capacity in global trade facilitation would raise world trade by about US\$377 billion (or by about 9.7%). Of the total gain, the largest (4%) would come from e-business, 2.8% would come from improvements in port efficiency, 2.2% from improvements in regulatory environment and 0.8% from improvements in customs environment. The gains from exporters' improvements in trade facilitation are much greater than those from importers' improvements. Clearing the red tape at country borders would generate roughly twice the contribution to GDP than tariff liberalisation.

5 Monitoring logistics capabilities

5.1 The Logistics Capability Index (LOCAI)

Logistics Performance Index referred to in Section 3 provides a valuable snapshot of the collective perception by international freight forwarders, who are constantly dealing with trade logistics operations across the world. Still, this type of ‘soft data’ should be complemented by a representative set of ‘hard’ indicators on countries logistics capability to get a valid and comprehensive picture of the situation. This section describes an attempt to create that type of a tool.

Logistics capability is capacity of a country (location) to provide modern, reliable and dense infrastructures, business-friendly environment, high quality of logistic services, and trade facilitation, to respond to contemporary business needs of efficient delivery of raw materials to producers and products from producers to final consumers. Countries can be compared by their logistical capabilities by constructing a Logistics Capability Index (LOCAI). The LOCAI combines relevant data from various sources into a composite index. The higher a country ranks in its logistic capability index, the more likely a country will be able to attract FDI and to connect to regional and GVCs.

LOCAI is a composite index of the five underlying factors, including modern infrastructure, traditional infrastructure adapted to multi-modal transportation, trade facilitation, quality of logistic services and soft infrastructure (Figure 4). Proxy measures for these underlying factors and the availability of the data to construct them are described in Table 2.

Figure 4 Underlying factors of LOCAI (see online version for colours)



Table 2 Example of a data availability matrix for a tentative LOCAI

<i>Index factors</i>	<i>Sources</i>	<i>Period covered (1997/1998 onwards)</i>	<i>Country or Region</i>
<p>1 <i>Modern IT Infrastructure (MI)</i></p> <p>Measured by penetration:</p> <ul style="list-style-type: none"> • Telephones • Internet access • PCs 	Digital access index, ITU, except education and literacy	All years covered Data available	All years covered Data available
<p>2 <i>Traditional Infrastructure adapted to Multi-Modal transportation (TIMM)</i></p> <p>Defined as accessibility of ports and airports by road and rails, adapted to multi-modal transportation). Measured by:</p> <ul style="list-style-type: none"> • Transport costs as percentage of import value • Roads and railroad tracks per 1000 sq km • Road-transport of (standard) container • Number of seaports and cargo-airports • Possibilities to handle containers • Stations and border crossings • Inventories in port by vol. (sqc) or standard-container • Daily costs of inventory holding • Turnover time for big container ships • Vessels in queue 	<p>UNCTAD/ WTO</p> <p>World Bank</p> <p>Various sources</p>	All years covered Data available but needs to be checked	All years covered Data available, but needs to be checked
<p>3 <i>Trade Facilitation (TF)</i></p> <p>Defined a wide range of rules, procedures, and mechanisms that can help the simplification, harmonisation, automation and speeding up of the goods and information flows across the borders.</p> <p>Measured by:</p> <ul style="list-style-type: none"> • Customs clearance time • Raw material stocks in comparison • With developed countries as percentage of GDP • Utilisation rate of trucks, • Charging/discharging costs in ports in developing and developed countries for each unit of homogeneous good • Delay times in delivery 	<p>World Bank, EASTR</p> <p>Various sources</p>	Data available but needs to be checked.	Data available but needs to be checked

Table 2 Example of a data availability matrix for a tentative LOCAI (continued)

<i>Index factors</i>	<i>Sources</i>	<i>Period covered (1997/1998 onwards)</i>	<i>Country or Region</i>
<p>4 <i>Quality of Logistic Services (QS)</i></p> <p>Defined as availability and quality of inter-modal transport services, freight forwarding, 3rd Party Logistics/4th party logistics. Measured by:</p> <ul style="list-style-type: none"> • Number of companies offering inter-modal transport services; freight forwarding, 3PL/4PL market share 	Transport intelligence	Data available but needs to be checked	Data available but needs to be checked
<p>5 <i>Soft Infrastructure (SI)</i></p> <p>Defined as regulatory (laws and regulations on trade facilitation, custom laws, standardisation in packaging and labelling). Measured by:</p> <ul style="list-style-type: none"> • Transport laws and other regulations • Regulations on trade facilitation • Custom laws • Standardisation in packaging and labelling 	WTO	Data available but needs to be checked	Data available but needs to be checked

Source: Memedovic, Ojala and Naula

In constructing the LOCAI, some operational constraints are foreseeable and they relate to the availability of input data. There are indications that a substantial part of the data for the least developed countries could be entirely missing, or can be of poor quality. This problem is unavoidable, but can be solved by the methodological design. A possible solution to the problem may be to introduce a 'confidence score', which would suggest the reliability of the result data, and depending how comprehensively some input data are covered. The confidence score would allow including the most of the desired data sets, if not all-inclusive one. Another risk on the data availability is the high gathering costs.

The LOCAI will be directly linked to the transport sector, transport infrastructure and logistics services sub-sectors and enabling their worldwide rankings. Its application would be useful for the following initiatives:

- economic development analyses requiring country competitiveness rankings
- the respective countries involved who can see their relative positions in their regions or internationally
- financial institutions or corporations involved in transport infrastructure investments needing the data for location decision-making
- the logistics sector, for assessing the major physical, managerial and regulatory bottlenecks of the industry
- global and regional organisations dealing with trade and transport facilitation and economic development.

Creating a workable logistics environment is needed for any low- and middle-income country to address a variety of economic and social development challenges. Since logistics is underpinning economic development, this indicator will help placing the Millennium Development Goals into perspective by identifying the bottlenecks in gaining access to global markets.

6 Policy implications

Countries seeking to benefit from globalisation and from GVCs need to address key underlying factors of their logistics performance and how these influence their supply chain capabilities, productivity and competitiveness. The driving factors of competitive logistics, modern and traditional infrastructure (transport and ICT), quality of logistics services, legal and regulatory framework for these services, and trade facilitation are closely interrelated.¹⁰ Addressing only one of them is unlikely to produce notable improvements in productivity and competitiveness. A comprehensive approach to reforms is therefore essential. These reforms should come from a clearly defined vision, strategy, policies and programmes that are formulated and coordinated by governments at various levels (sub-national, national and supra-national). Industrial policies should be complemented by other policies on trade, education and transport. Yet, it must also be acknowledged that the transport and logistics industries are dominantly private endeavours that tend to thrive and generate wealth in a deregulated environment. They include the following:

- large retail chains who are buying transport services from 3PL logistics firms
- freight forwarders who are trading and brokering orders
- large ocean shipping companies who are responsible for moving a considerable amount of cargo worldwide
- port and terminal operators that manage a vast portfolio of transport assets
- large conglomerates having multiple production and distribution units (e.g. Japanese *keiretsus*).

These firms are able to command the conditions of delivery that have to be fulfilled by service providers. Transport and distribution firms are impelled to provide high service quality at low cost, in a highly competitive environment. The uneven distribution of power depends on the firms' position in the chain, on market demand, on its organisational or technological know-how and on firm size.

As countries upgrade their industrial and technological capabilities, the production of more technology-intensive goods with higher value to weight, and those that have lower transportation costs but require specialised logistics services becomes a possibility. A further application of cold chain logistics would grant to many developing countries substantial benefits by participating in niche GVC segments. Perishable goods such as horticulture, fruit and vegetables and technology-intensive agricultural products need special handling, packaging, just-in-time delivery and the ability to meet certification requirements for food safety. Similarly, in electronics, tightly integrated supply chains and production networks, and coordination with certification bodies for product safety are needed. Technical and managerial capabilities need to be accompanied by capabilities

in transport infrastructure; 'hard assets' are the most efficiently used in conjunction with 'soft assets'.

Some of the driving factors of logistics capabilities, e.g. most infrastructures, laws and regulations, and knowledge, are public goods – meeting in most cases the criteria of non-excludability and non-rivalry, implying that public sector has traditionally been involved in their provision. But government investment in these public goods can be constrained by fiscal deficits and budgetary cuts. This can be offset by foreign aid and FDI arrangements such as concessions and operation arrangements. But, as showed by the port sector, private ownership or operation of transport infrastructure is a dominant trend that is likely to endure.

National governments also need the capacity to regulate the sector and knowledge about best practices in logistics, and which specific logistics services are needed for specific industries. These are also considered as public goods that can be provided by some international organisations within their mandate as knowledge brokers and as a global forum. Being aware of the strong relationships between logistics drivers' enhancement and economic growth and development represents a significant contribution to development objectives.

At the national policy-making level, commitments to deal with inadequate regional transportation and telecommunication networks (including roads, railways, ports, inland waterway transport, major civil aviation lines, broadband connectivity, and so on), technical standardisation and harmonisation, different custom procedures and clearance, standards and conformity, and coordination of policies and programmes deserve high priority. National development strategy should lead to bilateral and multilateral agreements covering various issues. At the supra-national, regional level, substantial welfare gains can be reached by improving underlying factors of logistics performance in the lagging countries (Wilson et al., 2004). Poor logistics, transport and trade facilitation capabilities may have negative consequences for welfare gains for all countries in a region, despite their relative advantages in natural and other resources because of the segmented regional markets.

Although pursuing regional economic integration through trade agreements may stimulate intra-regional trade and capital flows, the benefits of trade openness for growth will not be realised unless concerted actions are invested in enhancing regional infrastructure and in harmonising national and regional rules and policies for transport, trade facilitation, standardisation and conformity. Positive externalities from well-planned and geographically integrated regional infrastructure can be significant for all countries in a region and especially for small and landlocked countries, and their long-term effect should also be considered.

Regional economic agreements covering aspects such as modernising mobility infrastructure; setting up energy supply networks; standardising, modernising and coordinating cross-border procedures; setting up trade and transport corridors; and helping and coordinating multi-modal transport (as in MERCOSUR) can contribute to deal with market and coordination failures in a region and can speed up policy reforms in some countries. This can stimulate trade and capital relations among neighbouring countries. Cooperation on trade corridors can also bring about clusters in transport value chains and can help to set up intra-regional cluster linkages, involving SMEs. Clusters in a region can benefit from the differences in production factor costs and from complementarities in the different business environments. Intensified competition and

cooperation between industrial locations in the region would stimulate reforms in the business environment that would benefit productivity and competitiveness enhancement.

7 Conclusion

The setting of GVC has benefited several regions of the world, export-oriented economies, large consumption markets and many intermediary locations in global freight distribution. Substantial differences in logistics capabilities that correlate with differences in transaction costs, trade performance and poverty ratings exist across countries and regions. Such a setting leaves several developing countries wondering how and how much their logistics capabilities can be improved and also which benefits can be derived for growth opportunities. By raising the awareness of these opportunities through a LOCAI, growth in trade could be promoted, which would translate into improved welfare. Yet, as the realisation that logistics capabilities contribute to economic growth sets in, the industry itself is subject to changes and challenges.

One of these challenges concerns energy. How will global production and distribution adapt to an environment where energy prices are likely to remain high? Is the current global logistics system flexible and adaptable enough to face a possible energy transition challenge? Would this energy challenge lead to modal shifts and to the alternative transport routes emerging and to the usage of new gateways and hubs, leading to a 'regionalisation' of production? Can the logistics capabilities of developing countries respond to these challenges or were the GVCs spreading simply a transitional phase permitted by cheap oil?

Developing countries with less efficient inland transport systems, with few options outside trucking, and lacking a variety of supply chain practices (like modal shift and consolidation) are likely to be more vulnerable to higher distribution costs. Despite comparative advantages in labour and other inputs, the risks of volatility and more distribution costs may result in a marginalisation. Those countries that participate in GVC based on cheap labour and do not have advantages in natural resources may even experience a decline in foreign investments at least in locations outside coastal gateways and inland corridors. The energy challenge can also be viewed as an opportunity to innovate through reaching a higher integration between maritime, rail and truck transport systems depending on regional characteristics. Any improvements in logistics, despite the energy part, would likely result in new opportunities.

There is also a need for empirical research. Since distribution is closely related with the entire value chain, logistics interdependencies with global production systems and networks, as well as with wholesale and retail markets, are relevant subjects of research. This underlines a better understanding of the degree to which logistics principles and requirements are becoming crucial for organisational or locational decisions of such firms.

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Notes

- 1 Reference: CSCMP, available online at: <http://cscmp.org/AboutCSCMP/Definitions/Definitions.asp> (accessed on 25 March 08); the organisation was previously known as Council of Logistics Management (CLM).
- 2 According to CSCMP, a trade organisation based in the USA, SCM is defined as "Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies". Available online at: <http://cscmp.org/AboutCSCMP/Definitions/Definitions.asp> (accessed on 25 March 2008).
- 3 This is in contrast to the Second Party Logistic (2PL) concept, where the internal transportation and warehousing functions of a company are unified in a separate internal logistics department. In industrialised countries, almost a third of logistics turnover is contracted to 3PL providers, while in many industrialised East Asian countries around 10% of trade-related transport services are provided in this way.
- 4 For instance, warehouses are adding value by using Radio-Frequency Identification (RFID) tags (or transponders) in packaging, assembly and storage. These automatic identification methods make it possible to keep track of products at all times and enhance security.
- 5 In Europe, the top 20 companies account for 33% of the logistics services market.
- 6 Feenstra et al. (2002) reported that value added by Hong Kong intermediaries was estimated at an average of 16% of the value of exports.
- 7 Quality of logistic services, defined as inter-modal transport services, freight forwarding, 3rd Party Logistics/4th party logistics, is discussed in more detail in Ojala et al., in this *IJTLID* Special Issue.
- 8 According to the WTO, trade facilitation assumes measures to simplify, standardise and modernise import-export and transit procedures – particularly those relating to customs procedures. Better and clearer rules in this area could have enormous benefits for development. By standardising customs procedures, common rules can improve transit times, cut red tape and improve transparency.
- 9 One-stop shops are suggested in international for a discussion as one possible solution for SMEs to eliminate the numerous intermediary steps needed to comply with custom procedures.
- 10 Over-regulated transport services, monopolies and institutional failures may cause serious inefficiencies in the provision of transport services.