

Connecting to Compete: Trade Logistics in the Global Economy

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The increase in global production sharing, the shortening of product life cycles, and the intensification of global competition all highlight logistics as a strategic source of competitive advantage. Given their importance to facilitating trade in goods, the efficiency and costs related to trade logistics constitute key components of the Enabling Trade Index (ETI), discussed in Chapter 1.1 of this *Report*. The present chapter complements Chapter 1.1 by providing a detailed analysis of the trade logistics so important for enabling the free flow of goods internationally.

Technological advances and economic liberalization have created new opportunities for countries to harness global markets for economic growth and development. But expanded supply chains and global production networks put a new premium on moving goods in a predictable, timely, and cost-effective way. Being able to connect to what has been referred to as the “physical internet” is fast becoming a key determinant of a country’s competitiveness.¹ For those able to connect, the physical internet brings access to vast new markets; but for those whose links to the global logistics web are weak, the costs of exclusion are large and growing. Whether it is a cause or a consequence, no country has grown successfully without a large expansion of its trade.

Well-connected countries can have access to many more markets and consumers: a country as distant from most major markets as Chile can be a major player in the high-end world food market, supplying fresh fish and perishable fruits to consumers in Asia, Europe, and North America. But for the poorly connected, the costs of exclusion are considerable and growing, and the risks of missed opportunities loom large, especially for the poorest landlocked countries, many of them in Africa.

In this highly competitive world, the quality of logistics can have a major bearing on a firm’s decisions about which country to locate in, which suppliers to buy from, and which consumer markets to enter. High logistics costs and—more particularly—low levels of service are a barrier to trade and foreign direct investment (FDI), and thus to economic growth. Countries with higher overall logistics costs are more likely to miss the opportunities of globalization.

Take landlocked Chad, for example. Importing a 20-foot container from Shanghai to its capital N’djamena takes about ten weeks at a cost of US\$6,500. Importing the same container to a landlocked country in Western or Central Europe would take about four weeks and cost less than US\$3,000. The shipping costs and delays from Shanghai to Douala, the gateway for Chad, and to West European ports are essentially the same. And the same international freight forwarding company would handle the container from Douala to N’djamena and within Europe. So what accounts for the large difference in time and cost?

The answer lies in better processes, higher-quality services, and the operating environment. The forwarder

in Europe would use a seamless, paperless system to manage the inland shipment from its 8-hectare campus in the gateway port of Le Havre. The transport inside Europe would take less than three days. And to add value for its client and generate more business, the forwarder would provide additional services, such as improving the client's internal distribution practices.

In Chad the process would be different. Although only five days should be needed to move the container from Douala to N'djamena, the actual time would likely be as long as five weeks. In a difficult governance and security environment, the freight forwarding company would be trying simply to avoid a breakdown in its client's supply chain. It would maintain company staff along the trade corridor to physically track the goods and trade documents. And it would have to be ready to mediate with the trucking syndicate, the security forces, and myriad government agencies.

Measuring logistics performance

Improving logistics performance has become an important development policy objective. The performance of customs, trade-related infrastructure, inland transit, logistics services, information systems, and port efficiency are all critical to whether countries can trade goods and services on time and at low cost. This trade competitiveness is central to whether countries can harness globalization's new opportunities for development.

International logistics encompasses an array of actions ranging from transportation, consolidation of cargo, warehousing, and border clearance to in-country distribution and payment systems.

This sequence cannot be easily summarized in a single indicator. Nor is it easy to collect, on a global basis, the information to build a performance measure. Information on time and costs associated with some important logistics processes—such as port time, time to clear customs, and transport—provides a good starting point and in many cases is readily available. But this information, even when complete, cannot be easily aggregated in a single consistent cross-country dataset because of essential differences in the supply chain structure among countries. Perhaps more important, many critical elements for good logistics performance—such as the transparency of processes and the quality, predictability, and reliability of services—cannot be captured from the information available on time and costs.

To address this, the World Bank, with its professional and academic partners, has produced the (first) Logistics Performance Index (LPI) to start closing the knowledge gap and help countries develop logistics reform programs to enable trade and enhance their competitiveness.² Complementing existing international sets of competitiveness indicators—such as the World Bank's Doing Business measures and the World Economic Forum's Global Competitiveness Index—the Logistics Performance Index and its indicators propose a comprehensive

approach to supply chain performance (see Appendix A: Structure and composition of the LPI). It provides the first in-depth cross-country assessment of the logistics gap and constraints facing countries. Given their uniqueness and significance, the LPI data have also been used extensively in the Enabling Trade Index discussed in Chapter 1.1. Specifically, LPI survey data have been used to measure several aspects of the efficiency of import-export procedures as well as the availability and quality of transport services.

Key messages

The LPI provides some insights on the cost of poor logistics to country competitiveness—and the sources of those higher costs. A key insight from the survey of logistics professionals is that, although costs and timeliness are of paramount importance, traders are primarily concerned with the overall reliability of the supply chain. Costs related to hedging against uncertainty have become a significant part of logistics costs in many developing countries. Equally, the cost and quality of logistics are determined not just by infrastructure and the performance of public agencies, but also by the availability of quality and competitive private services. Moreover, in many developing countries, problems of adverse geography are compounded by a weak modern services sector because of poor institutions or overregulation.

The LPI shows how different countries are doing in the area of trade logistics, and what they can do to improve their performance. Country performance is largely influenced by the weakest link in the supply chain: poor performance in just one or two areas can have serious repercussions on overall competitiveness. It also points to significant differences in logistics performance across countries and regions, reflecting not only the expected disparities between developed and developing countries—especially the least-developed, landlocked countries—but, more important, significant differences among developing countries at similar levels of development. Countries that top the LPI ranking are typically key players in the logistics industry, while those at the bottom are often trapped in a vicious circle of overregulation, poor-quality services, and underinvestment. Among developing countries, logistics overachievers are also those experiencing economic growth led by manufactured exports.

Although performance outcomes such as domestic costs or the time taken to reach a destination are important, traders mostly value the performance of logistics services available to them: the reliability and predictability of the supply chain matter most. For example, traditional measures of performance such as direct freight costs and average delays, while important, may not capture the overall logistics performance and thus the ability of countries to use trade for growth. The predictability and reliability of shipments, while more difficult to measure, are more important for firms and may have a more dramatic impact on their ability to compete.

Indeed, professionals view the friendliness of border processes primarily in terms of the transparency and the predictability of clearance procedures. Even where countries have already implemented a customs modernization program, the coordination of border procedures between customs and other agencies (responsible, say, for sanitary and phytosanitary standards) is an important concern. Although much progress has been made in telecommunications and information technology, most logistics professionals are not satisfied with the quality of the physical infrastructure in many developing countries. Even where customs has been modernized, the coordination of border procedures between customs and other agencies remains an important concern. Logistics performance is more and more determined by the availability of quality, competitive private services such as brokering and warehousing.

Countries doing fairly well in logistics are also likely to do well in growth and competitiveness, export diversification, and trade expansion. Improvements in the supply chain contribute significantly to competitiveness by reducing transaction costs. At the same time, a

growing, diversifying economy is likely to have the will and the means to improve its logistics performance. Countries seeking to benefit more from globalization need to identify the key aspects of logistics performance, in particular in terms of their impact on competitiveness.

The Enabling Trade Index 2008 (ETI), discussed in Chapter 1.1 of this volume, is a detailed composite index measuring the factors and policies facilitating the free flow of goods over borders and to destination. It therefore covers many of the issues covered by the LPI, as well as market access issues (tariffs and non-tariff barriers, national proclivity to trade) and regulatory and security-related issues. Many of the LPI data have been used in computing the ETI for measuring aspects of the efficiency of import-export procedures as well as the availability and quality of transport services.

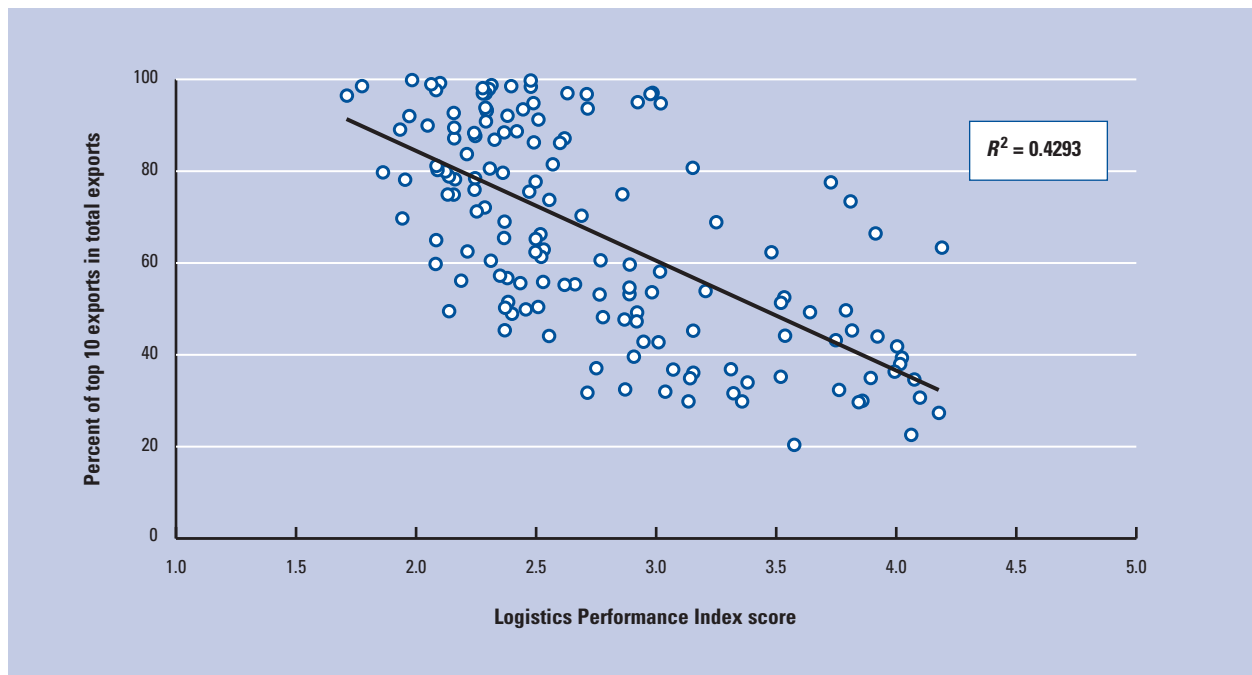
The added value of the LPI is that it provides a global benchmark of logistics efficiency and service quality not treated specifically in the World Bank's *Doing Business* series.³ Further, it provides critical input into the ETI and a detailed analysis of key issues related to enabling trade.

The LPI rankings are shown in Table 1.

Table 1: The First Logistics Performance Index

Country/Economy	LPI Rank	Score	Country/Economy	LPI Rank	Score	Country/Economy	LPI Rank	Score	Country/Economy	LPI Rank	Score
Singapore	1	4.19	India	39	3.07	Gambia, The	77	2.52	Serbia and Montenegro	115	2.28
Netherlands	2	4.18	Poland	40	3.04	Iran	78	2.51	Guinea-Bissau	116	2.28
Germany	3	4.10	Saudi Arabia	41	3.02	Uruguay	79	2.51	Laos	117	2.25
Sweden	4	4.08	Latvia	42	3.02	Honduras	80	2.50	Jamaica	118	2.25
Austria	5	4.06	Indonesia	43	3.01	Cambodia	81	2.50	Togo	119	2.25
Japan	6	4.02	Kuwait	44	2.99	Colombia	82	2.50	Madagascar	120	2.24
Switzerland	7	4.02	Argentina	45	2.98	Uganda	83	2.49	Burkina Faso	121	2.24
Hong Kong SAR	8	4.00	Qatar	46	2.98	Cameroon	84	2.49	Nicaragua	122	2.21
United Kingdom	9	3.99	Estonia	47	2.95	Comoros	85	2.48	Haiti	123	2.21
Canada	10	3.92	Oman	48	2.92	Angola	86	2.48	Eritrea	124	2.19
Ireland	11	3.91	Cyprus	49	2.92	Bangladesh	87	2.47	Ghana	125	2.16
Belgium	12	3.89	Slovak Republic	50	2.92	Bosnia and Herzegovina	88	2.46	Namibia	126	2.16
Denmark	13	3.86	Romania	51	2.91	Benin	89	2.45	Somalia	127	2.16
United States	14	3.84	Jordan	52	2.89	Macedonia, FYR	90	2.43	Bhutan	128	2.16
Finland	15	3.82	Vietnam	53	2.89	Malawi	91	2.42	Uzbekistan	129	2.16
Norway	16	3.81	Panama	54	2.89	Sri Lanka	92	2.40	Nepal	130	2.14
Australia	17	3.79	Bulgaria	55	2.87	Nigeria	93	2.40	Armenia	131	2.14
France	18	3.76	Mexico	56	2.87	Morocco	94	2.38	Mauritius	132	2.13
New Zealand	19	3.75	Sao Tome and Principe	57	2.86	Papua New Guinea	95	2.38	Kazakhstan	133	2.12
United Arab Emirates	20	3.73	Lithuania	58	2.78	Dominican Republic	96	2.38	Gabon	134	2.10
Taiwan, China	21	3.64	Peru	59	2.77	Egypt	97	2.37	Syria	135	2.09
Italy	22	3.58	Tunisia	60	2.76	Lebanon	98	2.37	Mongolia	136	2.08
Luxembourg	23	3.54	Brazil	61	2.75	Russian Federation	99	2.37	Tanzania	137	2.08
South Africa	24	3.53	Guinea	62	2.71	Zambia	100	2.37	Solomon Islands	138	2.08
Korea, Rep.	25	3.52	Croatia	63	2.71	Senegal	101	2.37	Albania	139	2.08
Spain	26	3.52	Sudan	64	2.71	Côte d'Ivoire	102	2.36	Algeria	140	2.06
Malaysia	27	3.48	Philippines	65	2.69	Kyrgyz Republic	103	2.35	Guyana	141	2.05
Portugal	28	3.38	El Salvador	66	2.66	Ethiopia	104	2.33	Chad	142	1.98
Greece	29	3.36	Mauritania	67	2.63	Liberia	105	2.31	Niger	143	1.97
China	30	3.32	Pakistan	68	2.62	Moldova	106	2.31	Sierra Leone	144	1.95
Thailand	31	3.31	Venezuela, RB	69	2.62	Bolivia	107	2.31	Djibouti	145	1.94
Chile	32	3.25	Ecuador	70	2.60	Lesotho	108	2.30	Tajikistan	146	1.93
Israel	33	3.21	Paraguay	71	2.57	Mali	109	2.29	Myanmar	147	1.86
Turkey	34	3.15	Costa Rica	72	2.55	Mozambique	110	2.29	Rwanda	148	1.77
Hungary	35	3.15	Ukraine	73	2.55	Azerbaijan	111	2.29	Timor-Leste	149	1.71
Bahrain	36	3.15	Belarus	74	2.53	Yemen, Rep.	112	2.29	Afghanistan	150	1.21
Slovenia	37	3.14	Guatemala	75	2.53	Burundi	113	2.29			
Czech Republic	38	3.13	Kenya	76	2.52	Zimbabwe	114	2.29			

Source: Arvis et al., 2007a.

Figure 1: Logistics performance and diversification of exports, 2005

Source: UN COMTRADE; authors' calculations.

The LPI gap, trade, and FDI: Good logistics performers benefit more from globalization

The LPI gap (the difference between a country's actual LPI ranking and its expected ranking, based on its level of income) also highlights the association between logistics performance and trade and FDI outcomes. Good logistics performers benefit more from globalization. Logistically friendly countries are more likely to have better global value chain integration and attract export-oriented FDI. Since trade and FDI are the key channels for the international diffusion of knowledge, poor logistics may impede access to new technology and know-how, therefore slowing the rate of productivity growth. Conversely, increased trade creates demand for good logistics, putting pressure on facilitating reforms and sustaining a market for modern services.

This is demonstrated by cross-country analyses of the relationship among growth, export diversification or trade expansion, and the LPI. Countries ranked highly on the LPI also tended to have more diversified exports. For non-oil-exporting developing countries, the standard deviation of this gap is 0.3, while overachievers have a LPI gap of at least 0.5 (Figure 1).

Likewise, countries undergoing trade expansion (increased trade-to-GDP ratio) tended to also be those outperforming on the LPI relative to their level of income (those with a positive LPI gap). A logistics overachiever with an LPI gap of 0.5 experiences 2 percent more trade expansion, 1 percent more annual growth, or exports 40 percent more variety of products (see Figure

2 and Technical Note 2 in the appendix) than other countries at the same income level.

These significant correlations should be interpreted in terms of their association rather than causality.

Improvements in the supply chain contribute significantly to competitiveness by reducing transaction costs. At the same time, a growing, diversifying economy is likely to have the will and the means to improve its logistics performance.

Countries seeking to benefit more from globalization need to identify the key aspects of logistics performance, in particular in terms of their impact on competitiveness. This is the subject of the next section.

Logistics and competitiveness: Why predictability and reliability matter more than freight costs

Just as strong logistics performance is associated with increased trade in developing countries (described above), firm-level competitiveness is extremely sensitive to the quality of the logistics environment in which it operates. A firm's competitiveness is influenced by cost and performance of its supply chain, and thus depends on the overall logistics environment—but the main impact on a firm's competitiveness is less through cost than through the predictability of the deliveries.

Firms have to bear the direct costs associated with moving goods, such as freight costs, port and handling charges, procedural fees (such as bonds), agent fees, and side payments. But they also have to absorb the induced costs associated with hedging for the lack of predictability

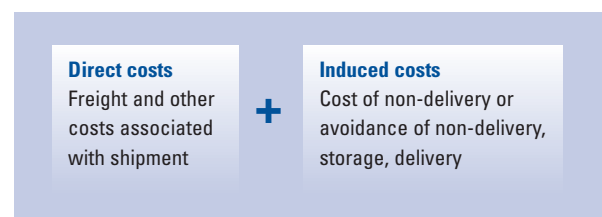
and reliability of the supply chain (Figure 2).⁴ They may need to carry higher inventories of supplies or finished products, or switch to more expensive modes of transportation to be sure to meet delivery schedules.⁵

Induced costs are inversely related to predictability and also tend to rise steeply with declining logistics performance. For example, suppliers to the same automobile manufacturer will carry 7 days of inventory in Italy but 35 days in Morocco. Some retailers in African countries maintain three months of inventories or more. Bangladesh has to ship, on average, 10 percent of its garment production by air to be certain to meet the schedules of European buyers.

The high induced costs of unpredictability in the international supply chain are a major constraint for companies and countries trying to diversify into higher-value production. In global production chains, countries face the double challenge of maintaining an efficient chain not just for exports but also for imported inputs and components. This can be a particular burden for least-developed countries, where inputs often cannot be sourced regionally.

Improvements in the quality of the supply chain can thus open new opportunities to entrepreneurs, even in otherwise constrained countries. Southern Mali and Burkina Faso can consider diversifying into exports of fresh mangoes (three-week shelf life) as well as cotton exports (typically stored at ports for months), thanks to greater cooperation between local operators and

Figure 2: Structure of logistics costs supported by traders

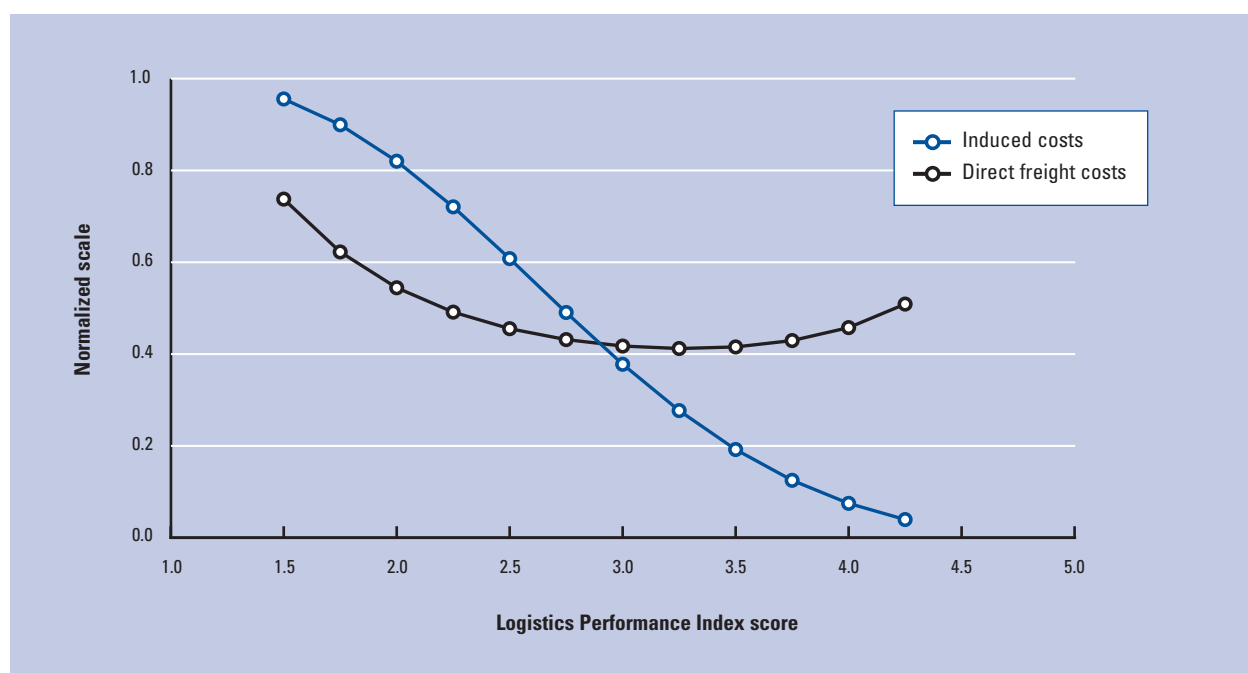


Source: Arvis et al., 2007b.

international logistics providers, as well as to better performance of the railroad from Abidjan, following a well-executed privatization program.

Induced costs in countries with good logistics performance are much lower than those for countries with low logistics performance (Figure 3), differences that can determine a product's competitiveness in international markets. By contrast, direct logistics costs tend to be much more similar across countries and across different logistics performance levels. They are therefore less of a differentiating factor in a country's ability to compete. Domestic freight services are tradable, at least regionally. The costs of capital and some direct inputs, such as fuel, are also fairly comparable, even in countries at very different levels of development. For developing countries, the lower cost of labor may be offset by lower productivity, hence the U curve for direct costs.

Figure 3: Direct freight costs vs. induced costs, assessed by respondent



Source: Arvis et al., 2007a.

Note: The normalized scale is a nonmonetary measure of the relative level of costs across countries, as assessed by respondents in the survey. The curves are fitted to a logistics model, with a utility quadratic in the LPI. *Induced costs* = the percent of respondents saying that import shipments are not cleared and delivered in time. *Direct costs* = the percent of respondents saying that overall direct logistics costs are high by international standards.

Excluding landlocked countries, the average inland costs (port and hauling) of importing a 40-foot container or semitrailer, for all countries in the survey, is about US\$700: typically 1.5 percent of the value of goods or the equivalent of two weeks of inventories, much less than the actual costs in many developing countries once large induced costs are factored in.⁶ This average masks wide differences. Large coastal countries, such as Russia and the United States, have higher costs because of long domestic distances. Other countries are primarily trading overland, as in Eastern Europe, which increases the costs.

Higher overall import costs are observed in low logistics performers. In Africa, even in the larger coastal economies of Nigeria and Kenya, the cost of importing or exporting a 40-foot container is in excess of US\$2,000. Costs are also increased by the low economies of scale for multimodal infrastructure or structural imbalances of volumes of trade along corridors. In some regions, especially in Africa and Central Asia, the freight costs are augmented by a proliferation of official and unofficial payments. In western Africa, facilitating payments and mandatory procedural fees double the direct cost of transportation.⁷

The competitive position of countries at an intermediate development level tends to be eroded if they have low logistics performance and thus much higher induced costs. Firms in lowest performing countries are even worse off, since they have to support both high freight costs and very high induced costs (see Figure 3).

The above trends show that the higher logistics costs borne by traders in poor environments are only partially associated with freight transport. And because of their endogenous nature, these costs can thus be lowered by better domestic systems and policies. The large differences observed between countries can be explained by the fact that the overall performance of a country is largely influenced by the weakest link in its supply chain. Poor performance, even in only one or two areas, can have very strong implications for overall country performance. This insight is important for the design of effective reforms.

Conclusions: Lessons for reform

By providing a comprehensive assessment of the gaps and constraints in logistics performance, the LPI and other information derived from the Logistics Performance Survey can help policymakers, private stakeholders, and international organizations quantify the constraints countries face in connecting globally.

The LPI provides some insights on the costs of poor logistics to country competitiveness—and the sources of those higher costs. Beyond cost and time taken to deliver goods, the predictability and reliability of supply chains is increasingly important in a world of just-in-time production sharing. Equally, logistics per-

formance is determined not just by infrastructure and the performance of public agencies, but also by the availability of quality and competitive private services—services such as trucking, customs brokering, and warehousing.

The LPI and its indicators also suggest that policymakers should look beyond the traditional “facilitation agenda” largely focused on trade-related infrastructure and information technology in customs, already widely recognized for their importance. To close the logistics gap, they should pursue improvements in the markets for logistics services, reduce coordination failures (especially those of public agencies active in border control), and build strong domestic constituencies to support reform.

Moreover, the LPI suggests that there are strong synergies among reforms to customs, border management, infrastructure, and transport regulations. Reforms in these different areas have a mutually reinforcing effect along all links in the logistics supply chain, directly contributing to predictability and performance. Countries performing well have a comprehensive approach, improving all the key logistics in parallel; those with a piecemeal approach, targeting a single link in the logistics chain, may see initial results but no lasting improvements. A comprehensive reform of logistics and trade facilitation is thus essential. But too few developing countries have created a virtuous circle of improvements. Countries at the bottom of the LPI rankings are typically trapped in a vicious circle of overregulation, poor-quality services, and underinvestment.

Reforms to improve logistics should follow an integrated approach, focusing on the interaction among infrastructure and public and private services, addressing coordination failures, and identifying constituencies for reform. To be effective, reforms should improve the predictability and reliability of shipments and not just focus on reducing average costs and delays. For instance, traditional measures of performance such as direct freight costs and average delays, while important, may not capture the overall logistics performance and thus the ability of countries to use trade for growth. The predictability and reliability of shipments, while more difficult to measure, are more important for firms and may have a much greater impact on their ability to compete.

This effort will demand a more integrated, comprehensive approach to supply chain-related reforms, according to the performance of countries, with implications for policymakers and development agencies. For the most severely constrained countries—typically landlocked countries in Africa and Central Asia—innovative solutions may need to be found, and international donors will have an important role.

Cross-cutting reforms need to be supported by broad constituencies. Creating an effective logistics environment requires consistent improvements and the

continuing participation of all stakeholders, who can demand concrete and practical improvements in performance. Although the problems to be addressed are rather specific, the ability to tackle them depends largely on a country's overall governance and institutional context. International companies can bring global knowledge and pressure for change. But the support of local constituencies of exporters, operators, and public agencies is crucial.

In identifying the key problem areas and constraints, the LPI and its indicators also aim to help guide the preparation of more in-depth, country-specific assessments and strategies, such as trade and transport facilitation audits,⁸ that are needed to generate concrete improvements in logistics performance.

The LPI rankings and indicators provide robust benchmarks that may help policymakers—and particularly the private sector—build the case for reform. By showing countries how they compare with their competitors, and shining a light on the costs of poor logistics performance, it is hoped that the LPI and its indicators may help countries break out of the vicious circle of “logistics unfriendliness.”

Notes

- 1 Makillie 2006.
- 2 The survey would not have been possible without the support and participation of the International Federation of Freight Forwarders Associations (www.fiata.com), the Global Express Association (www.global-express.org), the Global Facilitation Partnership for Transportation and Trade (www.gfptt.org), and 10 major international logistics companies. The survey was designed and implemented with Finland's Turku School of Economics (www.tukkk.fi/english/), which worked with the Bank to develop the concept in 2003.
- 3 These are a series of annually published reports and databases that can be found at www.doingbusiness.org.
- 4 Arvis et al. 2007b.
- 5 Guasch and Kogan 2003.
- 6 The typical value of a container of consumer goods is US\$50,000, while the inventory value is about 0.1 percent per day (Arvis et al. 2007b).
- 7 Arvis et al. 2007b.
- 8 Raven 2001.

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Appendix A: Structure and composition of the LPI

Freight forwarders and express carriers are in a privileged position to assess how countries perform on logistics. They manage operations from factory and warehouse to port, from port to overland transit, and through one or more borders to destination, with each link testing a country's logistics infrastructure performance. The World Bank's Logistics Performance Survey taps into the first-hand knowledge of logistics professionals worldwide, providing a comprehensive picture of supply chain performance—from customs procedures, logistics costs, and infrastructure quality to the ability to track and trace shipments, timeliness in reaching destination, and the competence of the domestic logistics industry.

The Logistics Performance Index and its indicators

The Logistics Performance Index and its indicators have been constructed from information gathered in a worldwide survey of the companies responsible for moving goods and facilitating trade around the world—the multinational freight forwarders and the main express

carriers. It relies on the experience and knowledge of professionals. Their views matter: they have a direct impact on the choice of shipping routes and gateways and can influence the firms' decisions about the location of production, choice of suppliers, and selection of target markets.

The indicators summarize the performance of countries in seven areas that capture the current logistics environment (Box A1). They range from traditional areas such as customs procedures, logistics costs (such as freight rates), and infrastructure quality to new areas such as the ability to track and trace shipments, timeliness in reaching a destination, and the competence of the domestic logistics industry. None of these areas alone can ensure good logistics performance.

The selection of these areas is based on the latest theoretical and empirical research,¹ and on extensive interviews with logistics professionals involved in international freight logistics.² The LPI synthesizes this information in a composite index to allow for comparisons (see Table 1 in the text).

Box A1: Building the Logistics Performance Index

The Logistics Performance Index (LPI) is built on information from a Web-based questionnaire completed by more than 800 logistics professionals worldwide—the operators or agents of the world's largest logistics service providers. Each respondent was asked to rate performance in seven logistics areas for eight countries with which they conduct business. For each respondent, the eight countries were automatically generated by the survey engine based on trade flows, income level, geographical position of respondent countries (coastal or landlocked), and random selection.¹ The country selection matrix is presented in Figure A1 in Technical Note 1. Performance was evaluated using a 5-point scale (1 for the lowest score, 5 for the highest). The seven areas of performance are:²

- efficiency of the clearance process by customs and other border agencies,
- quality of transport and information technology infrastructure for logistics,
- lease and affordability of arranging international shipments,
- competence of the local logistics industry,
- ability to track and trace international shipments,
- domestic logistics costs, and
- timeliness of shipments in reaching destination.

More than 5,000 individual country evaluations were used to prepare the Logistics Performance Index, which covers 150 countries.³ The LPI was aggregated as a weighted average of the seven areas of logistics performance.⁴ The index is con-

structed using the principal component analysis method in order to improve the confidence intervals.

Each respondent was also asked to evaluate the logistics performance and the environment and institutions in support of logistics operations in the country in which they are based.⁵ (This wealth of additional information on different aspects of logistics was used to interpret the LPI as well as to validate and cross-check the information underlying it. The questionnaire is available at www.worldbank.org/lpi.)

Notes

- 1 Although respondents know best the countries with which they trade most, relying on trade statistics alone would leave small and low-income economies uncovered.
- 2 In Arvis et al. 2007a, Appendix Table A1, the short names for these seven areas of performance are: customs, infrastructure, international shipments, logistics competence, tracking and tracing, domestic logistics costs, and timeliness.
- 3 See Table A2 in Technical Note 1 and Arvis et al. 2007a, Appendix Table A1; the Logistics Performance Index is also available at www.worldbank.org/lpi.
- 4 Domestic costs were found to be uncorrelated to the other areas in the LPI. Therefore, being less significant, this component was dropped from the composition of the index.
- 5 Arvis et al. 2007a, Appendix Tables A2 and A3; the Logistics Performance Index is also available at www.worldbank.org/lpi.

Appendix A: Structure and composition of the LPI (cont'd.)

The LPI and its indicators are given on a numerical scale, from 1 (worst) to 5 (best). This scale can also be used to interpret performance outcomes measures. For example, the analysis based on the additional country information gathered in the survey indicates that, on average, having an LPI lower by one point (say, 2.5 rather than 3.5) implies six additional days for getting imports from the port to a firm's warehouse and three additional days for exports. It also implies that a shipment is five times more likely to be subject to a physical inspection at entry.

Key factors determining logistics performance

To provide a more complete picture of the key factors determining logistics performance, the Logistics Performance Survey asked logistics professionals about the institutions and processes supporting logistics operations in the countries in which they are based (Table A1). It asked them to assess critical attributes of the supply chain, including timeliness of deliveries, quality of transport and IT infrastructure, efficiency of border clearance processes, competence of the local logistics industry, and domestic costs of services as well as provide time and cost data.³

The questions in the Logistics Performance Survey delved into the quality of infrastructure, the competence of private and public logistics service providers, the roles of customs and other border agencies, such governance issues as corruption and transparency, and the reliability of the trading system and supply chains.⁴ Reliability (measured by the predictability of the clearance process and the timely delivery of shipments) emerged as a key concern, with the difference in satisfaction between the

high- and low-performing countries much larger than for any other question in the survey. Some of the reasons for this are discussed at the end of this appendix.

This section draws upon the qualitative information provided by international operators based in the countries being evaluated to provide insights on the key institutions and processes determining logistics performance; it then analyzes the importance of reliability in logistics performance for competitiveness.

Quality of infrastructure

Telecommunications and information technology (IT) infrastructure are an essential component of modern trade processes. The physical movement of goods now entails the efficient and timely exchange of information. In countries in the LPI's top two quintiles, logistics operators rarely have any issues with the quality of the telecommunications and IT infrastructure, but close to half of them express concerns in countries ranging from average to lowest performers. In sub-Saharan Africa, 43 percent of respondents see this as an issue.⁵

The quality of transport infrastructure remains a concern in close to or more than half of the logistics operators in average, low, and lowest performers. That concerns also exist in even the highest and high performing countries reflects the challenge of maintaining physical infrastructure at a level able to satisfy rapidly growing demands.

Competence of private and public logistics service providers

The performance of the supply chain depends on the quality of services delivered by the private sector through customs brokers and road transport operators—

Table A1: How logistics professionals assess institutions and processes

Percent of respondents	Top quintile Highest performance	Second quintile High performance	Third quintile Average performance	Fourth quintile Low performance	Bottom quintile Lowest performance
Concerned about the quality of telecommunications and IT infrastructure	6	7	41	27	46
Concerned about the quality of the physical transport infrastructure (ports, roads, warehouses)	17	28	59	46	57
Satisfied with customs	55	32	19	18	11
Satisfied with other border government agencies	38	13	10	9	18
Satisfied with private logistics services ¹	59	34	18	16	11
Satisfied with professional organizations	46	28	6	21	17
Concerned with frequent solicitation of informal payments	6	23	34	49	56
Satisfied with transparency of border processes ²	72	44	38	33	26
Imports cleared and delivered as scheduled	87	69	32	39	13

Source: Arvis et al. 2007a, Appendix Tables A2, A3.

Notes:

1 Aggregation of customs brokers, distributors, and road operators.

2 Aggregation of the results of the predictability of changes in regulations and transparency of the customs clearance process.

Appendix A: Structure and composition of the LPI (cont'd.)

and on the competence and diligence of public agencies in charge of border procedures. In these areas, the three bottom quintiles generally fare much worse than the top quintile, and the differences in quality are as significant as those for infrastructure (see Table A1). For example, the satisfaction with customs brokers is fairly high for the upper-middle-income countries (around 50 percent), but it is only 8 percent for private providers in sub-Saharan Africa.⁶

For the lower performers, the dissatisfaction with the quality of trade logistics services applies to both the private and public sectors. In those countries where logistics performance is high, there is more satisfaction with private providers than with public providers. The negative view of private providers in the lower performers is an important insight. Too often in developing countries, and notably in Africa, inadequate regulations

and the absence of competition lead to corruption or poor services—such as those provided by “suitcase businessmen” at border posts. Often the mere presence of these operators disturbs the clearance process and hinders the emergence of competent local logistics operators who can work with international operators.

Customs and other border agencies

Clearance at the border is not only a matter of customs diligence. Law enforcement agencies and ministries of agriculture and industry also intervene in the process. Customs performance tends to be better than that of other border agencies; on average, customs clearance accounts for a third of import time (Box A2). This underscores the importance of addressing the coordination of border agencies, especially in countries that already have attained good customs clearance.

Box A2: Modernizing border processes

Clearance processes by customs and other agencies are among the most important links in the global supply chain. Key facilitation principles have been addressed by several international agreements (such as the Kyoto convention, the World Trade Organization (WTO)'s General Agreement on Tariffs and Trade (GATT), and the current negotiations on trade facilitation at the WTO). In the Logistics Performance Survey, logistics professionals provide in-depth evaluation in this critical area, across countries.¹

The Logistics Performance Survey results show a high degree of information technology (IT) use in Africa, 55 percent, a credit to the United Nations Conference on Trade and Development (UNCTAD)'s Asycuda program and some home-grown projects.² Preshipment inspection is a major source of

delays in Africa (56 percent) and Latin America (43 percent).³ Physical inspections and the time needed for clearance are also strongly associated with overall logistics performance. But only one-third of the time to import is explained by the customs process, the rest by transportation, handling, or delays caused by private operators.

Notes

1 Arvis et al. 2007a, Appendix Tables A2, A3.

2 Information on the Asycuda program can be found at <http://www.asycuda.org/>.

3 Arvis et al. 2007a, Appendix Table A2.

Table: Customs and border processing performance, by quintile

	OECD high income	Non-OECD high income	East Asia & Pacific	Europe & Central Asia	Latin America & Caribbean	Middle East & North Africa	South Asia	Sub- Saharan Africa
Estimated percentage of physical inspections	3	22	22	14	25	45	36	48
Respondents agreeing that traders demonstrating high levels of compliance receive expedited customs clearance	54	25	41	51	42	42	57	17
Respondents able to use IT to submit customs declaration	70	42	28	46	58	53	50	55
Time between accepted customs declaration and customs clearance (days)	1.0	1.7	2.1	1.7	2.7	1.9	2.4	4.2
Average time to export (days)	2.3	2.9	3.9	2.8	3.9	3.7	3.6	8.1
Average time to import (days)	3.2	3.6	4.4	3.5	4.8	6.0	6.5	12.3
Cost to import a 40-foot container or semitrailer (US\$)	663	572	819	936	1,000	609	880	2,124

Source: Arvis et al. 2007a, Appendix Tables A2, A3.

1 The World Bank's classification of countries can be found at www.worldbank.org/data/

Appendix A: Structure and composition of the LPI (cont'd.)

Corruption and transparency

Logistics performance also depends on broader policy dimensions, including the overall business environment, the quality of regulation for logistics services, and, most important, overall governance. The way the local market for logistics services is regulated directly affects a country's ability to use the physical internet to connect to global markets. The transparency of government procurement, the security of property from theft and looting, macroeconomic conditions, and the underlying strength of institutions are critical factors in determining logistics performance. Unsurprisingly, ratings of the domestic environment in such areas as corruption and the transparency of processes and regulation reflect these findings. The rating for transparency of border processes consistently declines along with LPI scores for the following groups of countries: poor performers in the LPI were also poor performers on transparency of border processes (see Table A1). Solicitation of informal payments is rare among the top 30 countries but common among lower performers (close to or more than 50 percent of responses).⁷

Reliability of the trading system and supply chains

For traders at the origin or the destination of the supply chain, what matters most is the quality and reliability of logistics services, measured by the predictability of the clearance process and timely delivery of shipments to destination (see Table A1, where these data appear in bold). The difference in satisfaction between the high- and low-performing countries on this question is much larger than for any other question in the survey. Performance data derived from the survey on the time

(in days) for delivery of goods confirms the same phenomenon (Box A3).

Taken together, all these factors—quality of infrastructure, the competence of private and public logistics service providers, the roles of customs and other border agencies, governance issues such as corruption and transparency, and the reliability of the trading system and supply chains—confirm once again that logistics performance is about predictability (see Table A1). Predictability is central to the overall costs that companies incur in logistics and thus to their competitiveness in global supply chains.

Technical Note 1: Selection of countries

Figure A1 presents the matrix of how the eight countries with which they conduct business are selected, based on the respondent's country of work.

The LPI methodology uses the World Bank Classification of Countries.⁸ Table A2 classifies all World Bank Member countries (184) and all other economies with populations of more than 30,000 (208 total).⁹ The country coverage by the Logistics Performance Index (150 total) is also shown.

For operational and analytical purposes, economies are divided among income groups according to 2005 gross national income (GNI) per capita, calculated using the World Bank Atlas method. The groups are: low income, US\$875 or less; lower middle income, US\$876–3,465; upper middle income, US\$3,466–10,725; and high income, US\$10,726 or more. Other analytical groups based on geographic regions are also used.

Box A3: Customs and border processing performance, by quintile

The Logistics Performance Survey captures the time to import and export and, more important, the dispersion in time as a measure of predictability. Delays tend to increase with lower overall performance, but also with unpredictability. The effect is

much stronger in some countries in the bottom quintile—not only in poor, landlocked countries, such as Chad, but also in coastal Tanzania and Benin, which have import times of more than a week.

Table: Customs and border processing performance, by region (percent)

	Top quintile Highest performance (no. of days)	Second quintile High performance (no. of days)	Third quintile Average performance (no. of days)	Fourth quintile Low performance (no. of days)	Bottom quintile Lowest performance (no. of days)
Best time to import (best decile of shipments)	1.9	2.1	3.7	4.6	6.1
Median time to import	3.2	3.9	5.4	7.1	13.6

Source: Arvis et al. 2007a, Appendix Table A3.

Appendix A: Structure and composition of the LPI (cont'd.)

Technical Note 2: The Logistics Performance Index and multivariate regressions

Straightforward econometric analyses point to significant association between the LPI and outcomes, such as:

- Medium-term growth over the years 1992–2005.
- Trade expansion, defined as the overall annual change in trade openness over the same period. It is excess of trade growth over GDP growth.
- The index of trade diversification—the Theil index, which can be interpreted as the natural logarithm of the number of exported varieties.

The sample of countries excludes high-income countries and oil exporters. The results are robust to other choices of period (Table A3). Regression 1 measures the LPI against the level of development (Log [GNI/cap] 2005). The residual measures how much the countries are performing logistically against their potential (the standard deviation in LPI gap is 0.3). Regressions 2 through 6 measure one of the growth, trade expansion, or diversification variables against the LPI and Log (GNI/cap), or against the sole LPI gap.

Figure A1: Matrix: Six country-selection rules

	Respondents from LOW-INCOME COUNTRIES	Respondents from MIDDLE-INCOME COUNTRIES	Respondents from HIGH-INCOME COUNTRIES
Respondents from COASTAL COUNTRIES	Five most important export partner countries + Three most important partner countries	Three most important export partner countries + The most important import partner country + Four countries randomly, one from each country group: a) Africa b) East Asia + Central Asia c) Latin America d) Europe less Central Asia + OECD	Four countries randomly out of one list of five most important export partner countries and five most important import partner countries + Four countries randomly, one from each country group: a) Africa b) East Asia + Central Asia c) Latin America d) Europe less Central Asia + OECD
Respondents from LANDLOCKED COUNTRIES	Four most important export partner countries + Two most important import partner countries + Two landlocked countries	Three most important export partner countries + One most important import partner country + Two landlocked countries + Two countries randomly, one from each country group: a) Africa + East Asia + Central Asia + Latin America b) Europe less Central Asia + OECD	

Source: Arvis et al. 2007a, p. 22.

Table A2: Regional coverage of the Logistics Performance Index

Income groups/world regions	Total countries in group/region	Number of countries ranked in the LPI	LPI's coverage of group/region(%)
Low income	54	51	94
Middle income	98	65	66
Lower middle income	58	41	71
Upper middle income	40	24	60
Low & middle income	152	116	76
East Asia & Pacific	24	13	54
Europe & Central Asia	27	25	93
Latin America & Caribbean	31	21	68
Middle East & North Africa	14	11	79
South Asia	8	7	88
Sub-Saharan Africa	48	39	81
High income	56	34	61
European Monetary Union	12	12	100
High income (OECD)	24	23	96
High income (non-OECD)	32	10	31
Heavily indebted poor countries (HIPC)	40	37	93
Least developed countries (UN classification)	49	41	84
Landlocked developing countries (UN classification)	31	26	84
Commonwealth of Independent States	12	10	83
Transitional	24	22	92
Organization of Petroleum Exporting Countries	12	10	83
TOTAL COUNTRIES	208	150	72

Source: Arvis et al. 2007a.

Notes

- 1 The methodology developed by Daley and Murphy in 1993—using a survey format, a four-point scale, and open-ended questions—set out to measure the perceived importance and influence of different component attributes that affect the logistical friendliness of countries. In a follow-up study by Ojala and Qeios (2004), only those characteristics identified as best encapsulating logistics performance were included for evaluation.
- 2 These interviews were conducted in the context of the Trade and Transport Facilitation Audits (TTFA) performed by the World Bank and others (Raven 2001) and contributed substantially to refining the methodology.
- 3 See Arvis et al. 2007a, Appendix Table A2 for Country-specific environment and institutions data averages and Appendix Table A3 for Country-specific performance data.
- 4 In Appendix Table A2 of the World Bank's 2007 *Connecting to Compete: Trade Logistics in the Global Economy Report*, performance is evaluated in 30 subareas for which LPI quintiles, regional, or income group averages allow for meaningful comparisons. For most countries the number of respondents in this section of the survey is too small to warrant a country statistic.
- 5 See Arvis et al. 2007a, Appendix Table A2.
- 6 See Arvis et al. 2007a, Appendix Table A2.
- 7 Arvis et al. 2007a, Appendix Table A2.
- 8 See the World Bank's classification of countries, found at www.worldbank.org/data.
- 9 Details can be found at www.worldbank.org/data, under Classification.

Table A3: Results of LPI multivariate regressions

Independent variable	Dependent variable					
	Regression 1 LPI	Regression 2 Growth	Regression 3 Growth	Regression 4 Trade expansion	Regression 5 Trade expansion	Regression 6 Theil index
LPI		2.0%		3.7%		1.05
		(2.8)**		(3.5)**		(3.5)**
Log (GNI/cap)	0.422	-0.8%		-2.1%		0.95
	(7.1)**	(-1.5)*		(-2.7)**		(4.4)**
LPI gap			2.0%		3.7%	
			(2.8)**		(3.5)**	
R2	0.35	0.08	0.08	0.12	0.11	0.44
F	50.9	3.9	7.8	6.4	12.1	38.5
No. of countries	97	97	97	97	97	97

Source: Arvis et al. 2007a.

Note: * = Significant at the 5 percent level; ** = significant at the 1 percent level.

